NOTICE

All drawings located at the end of the document.

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PHASE I RFI/RI REPORT
WALNUT CREEK PRIORITY DRAINAGE
OPERABLE UNIT NO. 6

VOLUME 8

APPENDIX G
APPENDIX H
APPENDIX I
APPENDIX J

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U.S. Department of Energy
Rocky Flats Environmental Technology Site
Golden, Colorado

September 1995

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OU6 LIST OF ACRONYMS AND ABBREVIATIONS

1,1-DCA	1,1-dichloroethane
1,1-DCE	1,1-dichloroethene
1,1,1-TCA	1,1,1-trichloroethane
1,2-DCA	1,2-dichlorothane
1,2-DCE	1,2-dichloroethene
ac-ft	acre-feet
AEC	Atomic Energy Commission
af	man-made deposits
AGS	above ground surface
Am-241	Americium-241
AMSL	above mean sea level
AOC	Area of Concern
ARARs	applicable or relevant and appropriate requirements
BGS	below ground surface
BSL	Background Screening Level
Ca^{+2}	calcium
$CaCO_3$	calcium carbonate
CCl_4	Carbon tetrachloride
CDPHE	Colorado Department of Public Health and Environment
CDH	Colorado Department of Health
CEARP	Comprehensive Environmental Assessment & Response Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
CHC	chlorinated hydrocarbons
$CHCl_3$	chloroform
Cis-1,2-DCE	cis-1,2-dichloroethene
CLC	common laboratory contaminants

cm/sec	centimeters per second
cm	centimeter
COCs	chemicals of concern
CRQL	contract required quantitation limit
C_s-137	Cesium-137
CSM	conceptual site model
DCN	document change notice
d/m/l	disintegrations per minute per liter
DLG	Digital Line Graph
DOE	Department of Energy
DQO	Data Quality Objective
DRCOG	Denver Regional Council of Governments
ECD	Electron Capture Detector
EM	Electromagnetic
EMD	Environmental Management Department
EMRGs	Environmental Management Radiological Guidelines
EPA	Environmental Protection Agency
ER	Environmental Restoration
ERDA	Energy Research and Development Administration
ERP	Environmental Restoration Program
FDM	Fugitive Dust Model
FIDLER	field instrument for the detection of low-energy radiation
FSP	field sampling plan
GAC	granular activated carbon
gal	gallon
GS	gauging station
HCO^{3-}	bicarbonate
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment

HPGe	high purity germanium
HRR	Historical Release Report
HSP	Health and Safety Plan
ID	inside diameter
IHSS	Individual Hazardous Substance Site
in/hr	inches per hour
IRIS	Integrated Risk Information System
K; (K^+)	hydraulic conductivity; (symbol for potassium)
Ka	Cretaceous Arapahoe Formation
Kl	Cretaceous Laramie Formation
LHSU	lower hydrostratigraphic unit
mCi	millicurie
meq/l	milliequivalents
Mgal	millions of gallons
ml	milliliter
mm	millimeters
MSL	mean sea level
Na+	sodium
NAAQS	National Ambient Air Quality Standards
NPDES	National Pollutant Discharge Elimination System
OU	operable unit
OVM	organic vapor monitor
PA	protected area
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PCOC	potential chemical of concern
pCi/g	picocuries per gram
PID	photoionization detector

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Pu-239/240	plutonium-239/240
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
QAPjP	Quality Assurance Project Plan
Qc	Quaternary colluvium
QC	quality control
Q_{ls}	Quarternary landslides
Qrf	Quaternary Rocky Flats Alluvium
Qt	Quaternary Terrace Alluvium
Qvf	Quaternary Valley-Fill Alluvium
Ra-226	radium-226
RAD screen	radiological screen
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RFA	Rocky Flats Alluvium
RfCs	reference air concentrations
RfDs	noncarcinogenic reference doses
RFEDS	Rocky Flats Environmental Database System
RFETS	Rocky Flats Environmental Technology Site
RFI/RI	RCRA Facility Investigation/Remedial Investigation
RFP	Rocky Flats Plant
RI	remedial investigation
SEAM	Superfund Exposure Assessment Manual
SFs	carcinogenic slope factors
SO_4^{2-}	sulfate
SOP	Standard Operating Procedure
sq ft	square feet
sq mi	square mile

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Sr-89,90	strontium-89,90
STP	Sewage Treatment Plant
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TAL	target analyte list
TCE	trichloroethene
TCL	Target Compound List
TM	Technical Memorandum
TOC	total organic carbon
μg/kg	micrograms per kilogram
μg/l	microgram per liter
U-233/234	uranium-233/234
U-235	uranium-235
U-238	uranium-238
UHSU	upper hydrostratigraphic unit
USACE	U.S. Army Corps of Engineers
USCS	Unified Soil Classification System
UTL	upper tolerance limit
VOC	volatile organic compound
WARP	Well Abandonment and Replacement Program
W&I	Walnut and Indiana

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1.0
INTRODUCTION

During the 1991 to 1993 period of groundwater quality sampling, vinyl chloride was detected in saturated Valley Fill Alluvium in the South Walnut Creek Drainage. Vinyl chloride concentrations ranging from 200 μg/l to 860 μg/l were observed at Well 3586, located approximately 600 feet west of the Pond B-1 inlet. However, at Well 3686, located near the Pond B-1 inlet and hydraulically downgradient of Well 3586, no vinyl chloride was detected in the eight samples collected during that period. Vinyl chloride was identified as an OU6 chemical of concern in the Draft Final Technical Memorandum No. 4 Chemicals of Concern, Human Health Risk Assessment, Walnut Creek Priority Drainage, Operable Unit No. 6 (DOE 1994).

The presence of vinyl chloride at Well 3586 but not at Well 3686 raised a concern over the migration of this chemical in the shallow groundwater system within the South Walnut Creek drainage. It was suspected that vinyl chloride does not migrate toward Well 3686 due to volatilization of vinyl chloride in the shallow vadose zone environment. This study was undertaken to evaluate the fate and transport of vinyl chloride in groundwater and to understand the possible reasons why vinyl chloride was not detected at Well 3686.

A one-dimensional analytical groundwater solute transport model involving advection and volatilization processes was developed to simulate the transport of vinyl chloride in the saturated zone. The vinyl chloride concentration in groundwater at Well 3686 was estimated using the model. This report documents (1) the development of the transport equations, (2) the solution of the differential equation, and (3) the application of the transport model to the site.

2.0
CONCEPTUAL MODEL

Vinyl chloride dissolved in groundwater potentially is influenced by the following physical and chemical processes: advection, dispersion, retardation (adsorption/desorption), biodegradation, and volatilization. These processes were discussed in Section 5.2.4 of the main text of this report.

Advection is a process by which dissolved contaminants are transported by the bulk motion of the flowing groundwater. Advective contaminant transport occurs in response to groundwater flow, with dissolved contaminants moving in the same direction as the groundwater. Reactive contaminants (i.e., those that interact with the aquifer materials) usually move at rates slower (i.e., are retarded) than the average linear groundwater velocity. Non-reactive dissolved contaminants are carried at an average rate approximately equal to the average linear velocity of the groundwater flow.

Retardation is a process by which dissolved contaminants in groundwater move slower than the groundwater flow rate. This occurs due to interactions between the contaminant and the aquifer materials. The primary process influencing retardation is adsorption. As indicated in Section 5.2.4, the adsorption for vinyl chloride is insignificant. Therefore, retardation is not considered in this modeling study.

Volatilization of groundwater contamination occurs as dissolved organic compounds in groundwater vaporize into soil gas and migrate through the vadose zone to the atmosphere or collect in man-made structures such as basements of buildings. The rate at which volatilization occurs is proportional to the chemical specific Henry's Law constant.

The transport processes of vinyl chloride in groundwater in the Valley Fill Alluvium of the South Walnut Creek drainage were assumed to be dominated by advection and volatilization. As vinyl chloride is transported advectively downgradient from the source area (herein assuming Well 3586), volatilization reduces the mass of chemical in groundwater. As a result, the vinyl chloride concentration in groundwater gradually decreases downgradient from the source area (Figure G-1).

The transport of vinyl chloride from the upgradient location (Well 3586) to the downgradient location (Well 3686) can then be described by an analytical model (Section 3.0).

Note that as vinyl chloride moves in the aquifer, it undergoes diffusion and dispersion, i.e., spreading of the contaminant mass due to velocity variations. Dispersion further reduces the concentrations. Thus, a model that neglects dispersion would generally overestimate the concentration and hence would be conservative. Similarly neglecting bio-degradation is also a commonly used conservative assumption.

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Assumptions

The following assumptions were made in the development of the advection and volatilization transport equation applied to vinyl chloride migration in the shallow groundwater system of the South Walnut Creek drainage:

- Saturated groundwater flow in the Valley Fill Alluvium is one-dimensional, uniform, and steady.
- Solute transport occurs under steady-state conditions.
- Only advection and volatilization are considered. Dispersion, adsorption, and degradation are ignored.
- Vinyl chloride source concentration in groundwater at the upgradient well location (Well 3586) is considered steady.

Solute Transport Equations

The one-dimensional solute transport equation considering advection and volatilization can be derived from a mass balance analysis for the chemical of concern on a small element of the saturated zone along the flow pathway, as shown in Figure G-2;

$$\textbf{Mass In} - \textbf{Mass Out} - \textbf{Mass Volatilized} = \textbf{Change of Mass} \qquad (1)$$

where

Mass in = rate of mass inflow from the upgradient face ABCD (Figure G-2) estimated as:

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$$\text{Mass in} = h \cdot \Delta y \cdot q \cdot C \tag{2}$$

where

h	=	saturated thickness of aquifer
Δy	=	width of the saturated element
q	=	Darcy's groundwater velocity
C	=	contaminant concentration in groundwater

Mass Out = rate of mass outflow from the downgradient face EFGH:

$$\begin{aligned}\text{Mass Out} &= h \cdot \Delta y \cdot q \cdot C + \frac{d}{dx}[h \cdot \Delta y \cdot q \cdot C]\Delta x \\ &= h \cdot \Delta y \cdot q \cdot C + h \cdot \Delta x \Delta y \cdot q \cdot \frac{dC}{dx}\end{aligned} \tag{3}$$

where

Δx	=	length of the saturated element

Mass Volatilized = rate of mass outflow from face BCFG by volatilization:

$$\text{Mass Volatilized} = E = (\Delta x \Delta y)\,\epsilon \tag{4}$$

where

ϵ = emission rate per unit area;

Change of Mass = rate of mass change within the saturated element:

$$\frac{dM}{dt} = \Delta x \Delta y \cdot h \cdot \theta \frac{dC}{dt} \tag{5}$$

where

θ = effective porosity of porous medium

Substituting Equations (2), (3), (4), and (5) into Eq. (1) yields,

$$h \Delta y q C - \left[h \Delta y q C + h \Delta y q \frac{dC}{dx} \Delta x \right] - E = \Delta x \Delta y \cdot h \cdot \theta \frac{dC}{dt} \tag{6}$$

i.e.,

$$- hq \frac{dC}{dx} - \frac{E}{\Delta x \Delta y} = h \cdot \theta \frac{dC}{dt} \tag{7}$$

Assuming steady state solute transport, dC/dt = 0 and

$$\frac{dC}{dx} = - \frac{1}{hq} \frac{E}{\Delta x \Delta y} = - \frac{\epsilon}{hq} \tag{8}$$

which is the transport equation for vinyl chloride with the following upgradient boundary condition:

$$C(x{=}0) = C_o \tag{9}$$

where C_o = source area concentration of chemical in groundwater.

Volatilization Emission Rate

Under steady state conditions, the emission rate from the water table can be estimated by Fick's first law (Freeze and Cherry 1979).

$$E = (\Delta x \Delta y)\frac{D}{d}(C_{wtv} - C_a) \quad (10)$$

where

C_{wtc}	=	the vapor phase concentration at the water table
C_a	=	the vapor phase concentration at the ground surface
D	=	effective diffusion coefficient in porous medium, $D = D_i(P_a)^{4/3}$
D_i	=	diffusion coefficient of contaminant i in air, (cm^2/s)
P_a	=	effective air-filled soil porosity (dimensionless)

Generally C_a is much less than C_{wtv} and can be neglected. Thus, the emission rate is,

$$E = \Delta x \ \Delta y \frac{D}{d} C_{wtv} \quad (11)$$

Also,

$$C_{wtv} = CH_i' \quad (12)$$

where

H_i' is the dimensionless form of the Henry's Law Constant determined as follows (Lyman et at. 1990):

$$H_i' = \frac{H_i}{RT}$$

where

H_i	=	Henry's Law Constant of contaminant i, (atm-m^3/mol)
R	=	Gas constant, (8.2 x 10^{-5} atm-m^3/mol-°K)
T	=	Absolute temperature, (°K)

Substituting Eq. (12) in Eq. (11)

$$E = \Delta x \Delta y \frac{D}{d} C H_i' \tag{13}$$

Then, emission rate per unit area is

$$\epsilon = \frac{D}{d} C H_i' \tag{14}$$

Substitution Eq. (14) in Eq. (8).

$$\frac{dC}{dx} = -\frac{D}{hqd} C H_i' \tag{15}$$

<u>Solution of Transport Equation</u>

Integration of Eq. (15) with the upgradient boundary condition, Eq. (9), yields

$$C = C_o \exp\left[-\frac{DH_i'}{hdq} x\right] \tag{16}$$

Equation (16) indicates that contaminant concentration in groundwater along a flow pathway under steady state flow and transport conditions depends on the ratio of the upward emission rate in the vadose zone versus the horizontal advection rate in the saturated zone. The contaminant concentration in groundwater varies as an exponential function of distance, as illustrated in Figure G-1. If volatilization is negligible, contaminant concentration in groundwater along the flow pathway is approximately constant.

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APPLICATION OF ADVECTION AND VOLATILIZATION TRANSPORT EQUATION TO VINYL CHLORIDE TRANSPORT IN GROUNDWATER SYSTEM IN SOUTH WALNUT CREEK DRAINAGE

Parameter Assumption

The one-dimensional transport model for advection and volatilization (Eq. 16) was applied to evaluate the transport of vinyl chloride in the groundwater system within the South Walnut Creek drainage using the following parameters.

1. Henry's Law Constant, H_i = 2.78; 1.22, 0.022 atm-m^3/mol (Montgomery & Welkom, 1989).

2. Effective Air-filled soil porosity in the vadose zone, P_a = 0.03.

3. Hydraulic conductivity in Valley Fill Alluvium of the South Walnut Creek groundwater system, K = 1.4 x 10^{-4} cm/s (Section 3.6).

4. Approximate average hydraulic gradient in South Walnut Creek groundwater system, dh/dx = 0.035 (feet/foot) (Section 3.6).

5. Darcy groundwater velocity,

$$q = \left| -K \frac{dh}{dx} \right| = 4.9 \times 10^{-6} \text{ cm/s}$$

6. Diffusion coefficient of vinyl chloride in air, D_i = 0.10 cm^2/sec at 10°C (EPA 1988).

7. Average depth of vadose zone, d = 6 feet (183 cm).

8. Average saturated thickness of aquifer, h = 3 ft (91 cm).

9. Approximate distance between Wells 3586 and 3686 = 600 feet (18,288 cm).

Results and Sensitivity Analysis

Equation (16) was used to estimate the potential vinyl chloride concentration in groundwater at Well 3686 based on the assumed parameters. Results of the estimation are displayed in Table G-1. Results show that under assumed conditions, estimated vinyl chloride concentrations are either zero or extremely low at Well 3686. This is consistent with measured vinyl chloride concentrations at Well 3686. Results also indicate that estimated vinyl chloride concentrations are highly dependent on the assumed parameter values. Since site-specific data were not available for certain parameters such as the Henry's Law Constant, and some parameters (e.g., effective air-filled porosity, saturated thickness) vary when the flow conditions vary, sensitivity analyses were performed.

Sensitivity analysis results are presented in Table G-1. Simulation 1 is the baseline estimation based on parameter values given above. Sensitivity analyses were applied on four parameters: (1) Henry's Law Constant (simulations 2 and 3); (2) effective air-filled soil porosity (simulation 4); (3) depth of the vadose zone and saturated thickness (simulation 5); and (4) Darcy's velocity (simulation 6). Variations of parameters were within the range of values based on site-specific conditions and literature information.

For convenience in evaluating the sensitivity analysis, estimates of dimensionless concentrations at a distance of 10 feet away from Well 3586 are listed in the last column in Table G-1. Comparisons of results indicate that groundwater concentration of vinyl chloride could be potentially increased under the following conditions:

- Effective air-filled porosity is significantly reduced, during or immediately after precipitation.

- Groundwater velocity is much` greater than the average velocity estimated in Section 3.6.

- The Henry's Law Constant is at the lower end of the range referenced in the literature.

- Depth of vadose zone and saturated thickness are approximately equal.

Under all modeled conditions, the estimated groundwater concentrations of vinyl chloride are extremely low, even at a distance of 10 feet away from the source location (Well 3586).

Simulation 7 provides the result under a combination of worst conditions, using the low Henry's Law Constant value, small effective air-filled soil porosity, large groundwater flow velocity, and equal saturated thickness and depth of vadose zone. The estimated concentrations at Well 3686 are still relatively low, about 2 percent of the source concentration.

The primary reasons for vinyl chloride not migrating at significant concentrations in the Valley Fill Alluvium are believed to be:

- The high volatilization potential of vinyl chloride.
- The shallowness of the vadose zone and the thin saturated thickness of Valley Fill Alluvium.
- The low hydraulic conductivity of the Valley Fill material.

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5.0
CONCLUSIONS

A one-dimensional analytical solute transport model considering advection and volatilization was developed to evaluate the movement of vinyl chloride in the shallow groundwater system (Valley Fill Alluvium) within the South Walnut Creek drainage. The development of this one-dimensional analytical model was based on conservative assumptions, ignoring dispersion, retardation, and biodegradation. Application of the model with the assumed parameters indicates that volatilization of vinyl chloride through the vadose zone along the groundwater flow pathway depletes the chemical before it arrives at the downgradient location (Well 3686). The modeling result, which is consistent with observations, suggests that vinyl chloride present in the Valley Fill Alluvium near Well 3586 is not migrating at significant concentrations as far as the inlet area of Pond B-1, and is not expected to affect areas further downgradient under normal conditions.

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Lyman, W. J., W. F. Rechl, and D. H. Rosenblatt. 1990. Handbook of Chemical Property Estimation Methods. American Chemical Society. Second Edition, Washington, D.C., U.S.A.

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TABLE G-1

ESTIMATION OF GROUNDWATER CONCENTRATION OF VINYL CHLORIDE AND SENSITIVITY ANALYSIS

Simulation	Henry's Law Constant H_i (atm-m^3/mol)	Henry's Law Constant H_i' (dimensionless)	Effective Air-Filled Soil Porosity P_a (dimensionless)	Effective Diffusion Coefficient in Porous Medium D (cm^2/sec)	Depth of Vadose Zone d (cm)	Saturated Thickness h (cm)	Darcy's Velocity q (cm/s)	$\frac{DH_i'}{dhq}$ (cm^{-1})	C/C° (at X = 600 ft) (dimensionless)	C/C° (at X = 10 ft) (dimensionless)
1	2.78	119.8	0.03	9.3E-04	183	91	4.9E-06	1.36	0	0
2	1.22	52.6	0.03	9.3E-04	183	91	4.9E-06	0.60	0	3.8E-80
3	0.022	0.95	0.03	9.3E-04	183	91	4.9E-06	0.011	4.3E-88	0.035
4	1.22	52.6	0.01	2.15E-04	183	91	4.9E-06	0.14	0	2.9E-19
5	1.22	52.6	0.03	9.3E-04	137	137	4.9E-06	0.53	0	6.9E-71
6	1.22	52.6	0.03	9.3E-04	183	91	4.9E-05	0.06	0	1.1E-08
7	0.022	0.95	0.01	2.15E-04	137	137	4.9E-05	2.22E-04	0.017	0.93

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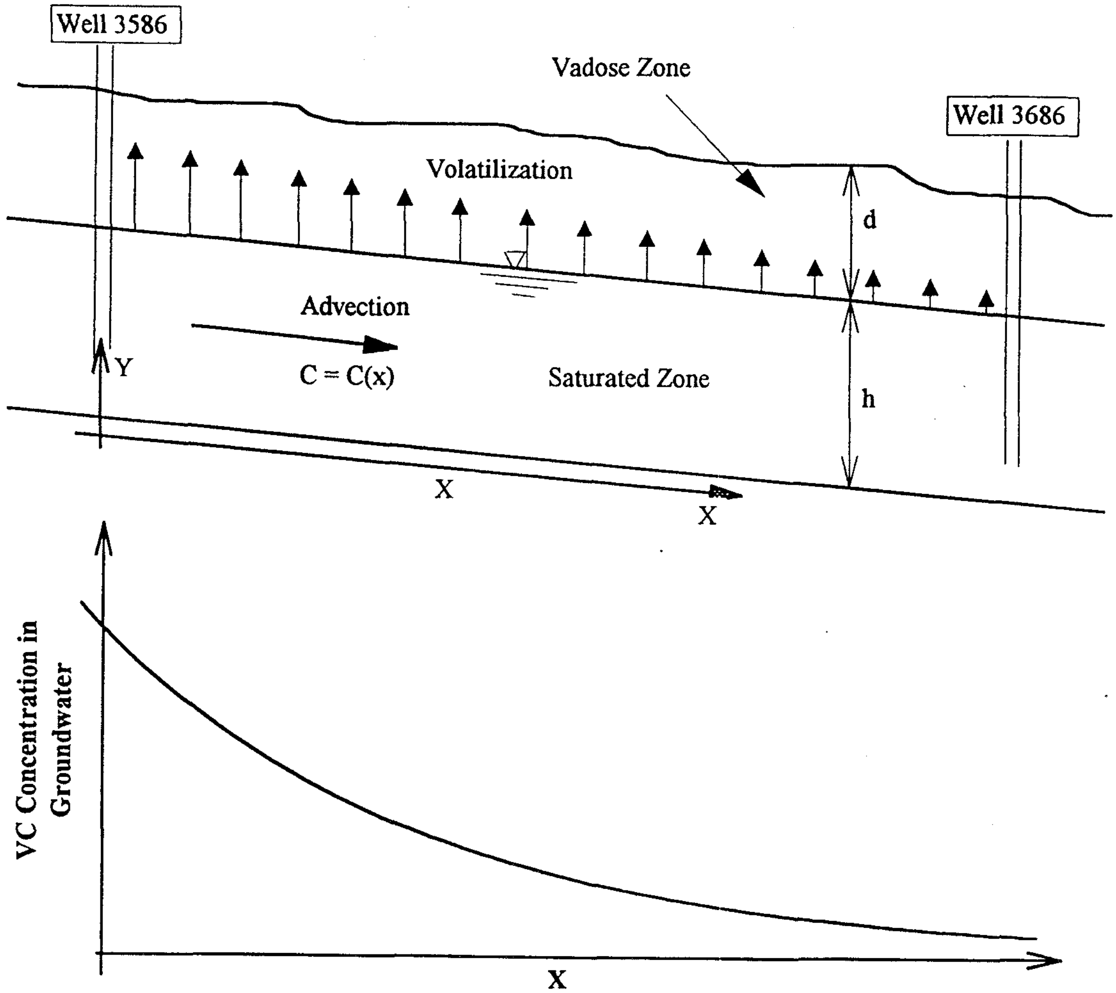

EXPLANATION

X GROUNDWATER FLOW DIRECTION
d THICKNESS OF VADOSE ZONE
h THICKNESS OF SATURATED ZONE
C CONCENTRATION

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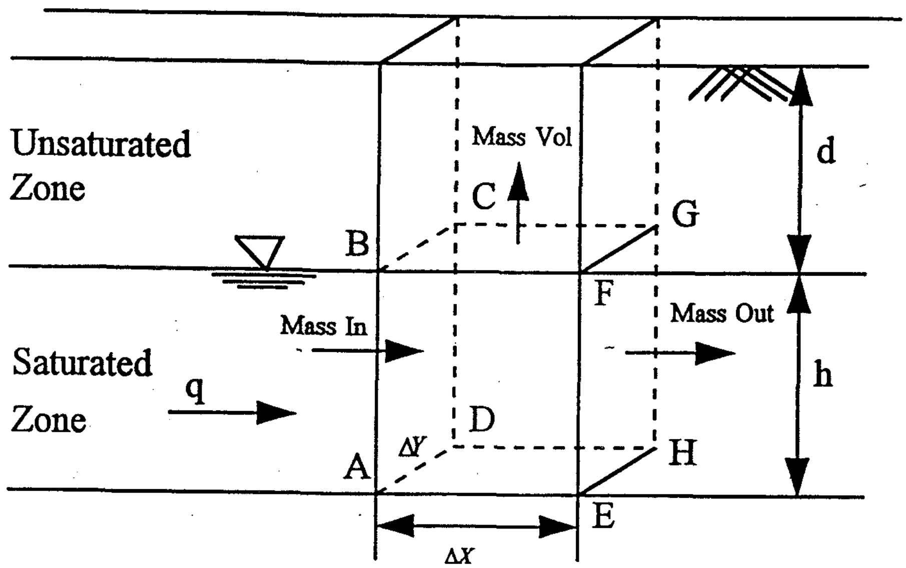
CONCEPTUAL VINYL CHLORIDE TRANSPORT IN GROUNDWATER

FIGURE G-1 JULY 1995

OU6RIXXX 1=1



EXPLANATION

q DARCY VELOCITY
d THICKNESS OF UNSATURATED ZONE
h THICKNESS OF SATURATED ZONE
ΔY WIDTH OF SATURATED ELEMENT
ΔX LENGTH OF SATURATED ELEMENT
POTENTIOMETRIC SURFACE

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SELECTED ELEMENT
IN THE SATURATED ZONE

FIGURE G-2 JULY 1995

OU6RIXXX 1=1

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H1.0
INTRODUCTION

H1.1 RFETS AND OU6 SURFACE WATER HYDROLOGY

The RFETS hydrologic drainage system includes three major intermittent streams: Woman Creek, Walnut Creek, and Rock Creek as shown in Plate 5.5-1 (Plate, Figure, Table, and Section numbers that do not include an "H" are in the body of this report rather than Appendix H.) The general flow pattern is from west to east. Because of the regional topography, these drainages extend westward only a short distance. The western reaches of these basins are characterized by a broad alluvial fan with a general slope of 2.5%, while the east side of the plant site contains steep drainage swales with slopes up to 5.5% (EG&G, 1992a). The majority of soils at RFETS have high infiltration rates and uniform vegetative cover.

The 20 Individual Hazardous Substance Sites (IHSSs) that comprise Operable Unit No. 6 (OU6) are also shown in Plate 5.5-1 and lie within the Walnut Creek drainage area. The predominant features of this drainage include the Industrial Area, the A-series and B-series ponds, and several tributaries to Walnut Creek. These tributaries are the McKay Bypass Canal which becomes the McKay Ditch, the unnamed tributary (sometimes called No Name Gulch) east of the Landfill Pond, South Walnut Creek, and the Central Avenue Drainage Ditch. The Landfill Pond and the Solar Ponds are designed such that they do not release into the Walnut Creek drainage system.

Besides the A-series and B-series ponds and the ditches used to convey storm water, other man-made features influence the surface water hydrology of OU6. Effluent from the wastewater treatment plant (WWTP) flows into Pond B-3 and accounts for much of the water in Ponds B-3, B-4, and B-5 (B-3 and B-4 are flow-through ponds). Furthermore, water is transferred from Pond B-5 to Pond A-4; thus, much of the water in Pond A-4 is WWTP effluent. The other major source of water in the ponds is runoff from the Industrial Area which is relatively high because of the large percentage of impervious area (roads, roofs, parking lots). Some of the buildings of the Industrial Area also have foundation drains which contribute baseflow to the ponds, especially during the spring months. Both sump and pump systems and gravitational drainage are employed at RFETS.

A more detailed discussion of OU6 hydrology is provided in Section 5.0 of the main body of this report.

H1.2 SELECTION OF MODELED CONTAMINANTS

To support the OU6 risk assessment, only sources within OU6 were used to estimate contaminant loads to the Walnut Creek drainage system. OU6 contaminant sources to the drainage system are surface soils and stream/pond sediments within the OU6 IHSSs. Groundwater loads were not considered a significant source and were not included in the model because the extent and degree of groundwater contamination in OU6 is minimal (Section 4.6).

Fate and transport of VOCs observed in pond water samples were not modeled because their concentrations are low enough (ranging from 2 μg/L for chloroform to 140 μg/L for acetone) that fate and transport processes, such as volatilization, would likely render these concentrations negligible over a 30-year time frame (the time frame for the health risk assessment). In lieu of using model predictions, measured concentrations were used in the human health risk assessment (Appendix J).

Six COCs were identified in surface soil: antimony, silver, vanadium, zinc, Pu-239/240, and Am-241. The metals are noncarcinogens and the radionuclides are carcinogens. Of these, the three COCs that would contribute most to health risk were selected for modeling, namely antimony, Pu-239/240, and Am-241. Antimony was selected as the "worst-case" metal to model, for the following reasons:

- Antimony is the most toxic of the metals detected in surface soil and contributed 80 percent of the total risk factor in the concentration/toxicity screen for selecting noncarcinogenic chemicals of concern in surface soil (Table J3-4).

- Concentrations of the other less toxic metal COCs are not high enough to outweigh the potential effects of antimony. For example, silver is the second most toxic of the metal COCs (Table J7-1), but silver concentrations must be approximately ten times greater than antimony concentrations for the toxicities to be equal. However, observed concentrations of antimony and silver were of equal magnitudes.

- The contribution of metals to overall risk will be relatively minor compared to that from radionuclides. Therefore, a single representative metal is adequate to demonstrate impacts on surface water and sediment from metal COCs in surface soil. If estimated antimony concentrations in surface water and sediment resulting from transport in storm runoff are shown to be of no concern for risk assessment, other metal COCs in surface soil will also be of no concern.

A total of 14 COCs were identified in pond sediment and stream sediment. These included six SVOCs (including PAHs and Aroclor-1254) and the same four metals and two radionuclides identified as COCs in surface soil. In addition, cobalt and strontium were identified at concentrations above background levels in stream sediment. However, only antimony, Am-241, and Pu-239/240 were included in the HSPF model, because these three contaminants are COCs in surface soils and thus there is a source (external to the creeks and ponds) which can possibly increase concentrations of antimony, Am-241, and Pu-239/240 in the ponds. The other COCs identified in pond sediment and stream sediment were not modeled because they are not COCs in surface soils and thus there is not a significant external source of loading to the creeks and ponds. For these other COCs, measured concentrations, rather than modeled concentrations, were used in risk assessment. Using measured concentrations to predict future concentrations of organic COCs, cobalt, and strontium is conservative because without a source current concentrations of these contaminants are not expected to increase. Additionally, a screening-level evaluation of migration of pond sediment showed that contaminants are not likely to migrate out of the series of detention ponds to Indiana Street (Attachment A in Appendix H).

H1.3 LOADING OF SELECTED CONTAMINANTS TO WALNUT CREEK

Transport processes that potentially affect the movement of chemicals via surface water include overland flow during precipitation/runoff events, flow from groundwater seeps, and advective transport and sediment transport in drainage channels and ponds. Fate mechanisms include adsorption/desorption partitioning between dissolved and adsorbed phases, settling and resuspension of particulate material, volatilization of dissolved VOCs from the water column, and radioactive decay of radionuclides. These fate and transport processes (in particular, the processes that affect contaminant migration within the creeks and ponds) are discussed in more detail in Section 5.1.3. This current section describes the conditions under which the three selected contaminants (antimony, Pu-239/240, and Am-241) are transported to Walnut Creek and its tributaries.

The three selected contaminants are highly associated with soils, and the loading of these contaminants to Walnut Creek primarily depends upon the washoff of soils rather than transport with groundwater seeps. Washoff of soils and associated contaminants occurs during and immediately after precipitation when runoff flows over pervious and impervious land segments. This fact can be illustrated by comparing water quality data for baseflow conditions with water quality data collected during a precipitation/runoff event. In 1993, W-C sampled baseflow at several locations along Walnut Creek and its tributaries. In May 1993, many of these same locations were sampled during a runoff event (baseflow and storm sample locations are shown on Plate H1-1). As shown in Table H1-1, concentrations of TSS and the two radionuclides are generally one to two orders of magnitude higher during storm runoff than during baseflow conditions. Antimony could not be used for this comparison because all of the samples - baseflow and storm event data - were measured at concentrations below the detection limit.

The 1993 data also indicate that runoff at locations downstream of impervious areas at RFETS carries more soil and contamination than runoff from pervious areas. This is likely due to the higher flow volumes from impervious areas which have greater energy to mobilize contaminated sediment, and, at locations where pervious areas or unpaved channels are downstream of impervious areas, this higher flow volume can possibly erode contaminated soils. In Table H1-1, the highest concentrations of TSS, Pu-239/240, and Am-241 are found in runoff at locations downstream of the relatively impervious Industrial Area. The highest concentrations in this data set were found in runoff at location SW69093; these values are generally two orders of magnitude greater than concentrations at other locations. This location receives runoff from the northeast part of the Industrial Area which flows through a steep ditch immediately upstream of the sampling location. The next highest concentrations for both radionuclides are in samples collected at SW68893 which is downstream of the southern part of the Industrial Area.

H1.4 OBJECTIVES AND METHODOLOGY OF SURFACE WATER MODELING

The objectives of the OU6 surface water modeling were:

- For use in the human health risk assessment (HHRA), simulate contaminant fate and transport from the primary source areas in OU6 to Walnut Creek, and estimate long-term average concentrations of contaminants in sediment and surface water in the creek and the detention ponds. If new data (for example, new contaminant concentration data for the pond sediments) become available, these data can be used with the model to update the HHRA.

- Provide a modeling tool to meet objectives other than the baseline HHRA, such as providing stream sediment information for ecological assessments, modeling contaminant loads from outside OU6 (such as from groundwater seepage from OU2), supporting evaluation of future use scenarios at Rocky Flats, and performing remediation/feasibility studies.

In support of the HHRA, the model was used to estimate 30-year mean concentrations of Plutonium-239/240, Americium-241, and antimony in the following media and locations:

- Accumulated pond sediment in each pond
- Pond water in each pond

The 30-year period was selected to correspond to the reasonable maximum residential exposure duration evaluated in the health risk assessment. The model was used to generate 30 simulations of 30-year average concentrations. Reasonable maximum 30-year exposure concentrations were defined as the 95 percent upper confidence limits (95% UCLs) on the frequency distributions of the means of the 30 model results. Modeled concentrations in pond surface water and sediment were used to represent exposure concentrations for onsite receptors.

Assessing the fate and transport of the three contaminants requires an analysis of the surface water hydrology, sediment transport and water quality fate and transport processes. A preliminary evaluation of the migration of pond sediment under extreme conditions was conducted by W-C (Attachment A), and it showed that there is little likelihood of pond sediment migrating out of the OU6 drainage system through surface water transport. However, a comprehensive understanding of the migration of the contaminants from the source areas to the receptors can only be gained by a comprehensive mathematical model that is capable of simulating the movement of water, sediment and associated constituents over and under the land surface, and through creeks, ditches and ponds. This model will be used not only to validate the conclusions in the preliminary evaluation of pond sediment migration but also to provide valuable information to risk assessment and other analyses. The model will first be calibrated under the current flow conditions and then be used to predict the long-term average concentrations of selected chemicals as required for the HHRA.

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HYDROLOGICAL SIMULATION PROGRAM - FORTRAN (HSPF)

Hydrological Simulation Program - FORTRAN (HSPF) was selected as the modeling tool for the OU6 surface water flow and transport study. This section briefly describes the structure, capability, and modeling procedures of this model.

H2.1 SELECTION OF HSPF

Version 10 of HSPF (Bicknell, et al., 1993) was selected for the OU6 surface water flow and transport modeling study because:

- It is a comprehensive mathematical model which can simulate the movement of water, sediment, and water quality constituents over and under pervious and impervious land segments and through streams, lakes, and reservoirs.

- It was developed by the U.S. Environmental Protection Agency (EPA) and has been tested extensively for the last 20 years.

- It is documented by a comprehensive users' manual published by the EPA (Bicknell, et al., 1993), and technical support is available from Aquaterra Consultants of Mountain View, California and Hydrocomp Inc. of Redwood City, California (Hydrocomp). Scientists at Aquaterra Consultants and Hydrocomp developed several earlier models which were used later in HSPF, and they have extensive experience in the application of HSPF.

H2.2 SUMMARY OF HSPF

H2.2.1 Origin of HSPF

HSPF is a hydrologic modeling package developed by the University of the Pacific under a contract with the Environmental Research Laboratory of the EPA starting in the late 1970s. The program was based on the following predecessor models:

- The Stanford Watershed Model (SWM), developed at Stanford University (Crawford and Linsley, 1966). It is used to simulate the hydrologic behavior of an entire watershed.

- The Agricultural Runoff Management (ARM) Model, developed by Hydrocomp for the U.S. EPA (Donigian, et al., 1977). It is used to simulate the hydrology, sediment yield, and nutrient and pesticide behavior of the land phase of the hydrological cycle. It is also used to simulate the washoff of miscellaneous pollutants from land surfaces.

- The HSP Quality Model, developed by Hydrocomp (Hydrocomp Inc., 1977). It is used to simulate the water quality processes in streams and lakes.

- The SERATRA Model, developed by Battelle Northwest Laboratories (Onishi and Wise, 1979). It is used to simulate the behavior of sediment and associated constituents in streams.

H2.2.2 Structure of HSPF

HSPF divides the watershed into several distinct computational elements or Processing Units (PUs): pervious land segments, impervious land segments, and free-flowing stream reaches and reservoirs (Figure H2-1). Each element is assigned meteorological, physical, and hydrologic properties. For each element, the hydrologic response is first simulated. Then water temperature, sediment transport, and chemical behavior are modeled based on the flow calculations. The user specifies how the various PUs are connected, forming the "network" of water, constituent, and information flow (Figure H2-1). The simulation of the entire watershed progresses from the most upstream element to the most downstream element, each operating as an independent unit. In other words, the model is kinematic such that an upstream element would not be affected by any change made to a downstream element.

HSPF has two classes of Operating Modules:

(1) Application Modules. These simulate the behavior of processes which occur in the land or stream elements. There are three Application Modules in HSPF (Figure H2-2).

(2) Utility Modules. These perform "housekeeping" operations on time series (e.g,. multiply a concentration time series by a flow time series to get a load time series). There are six Utility Modules in HSPF (Figure H2-2).

Figures H2-3 to H2-5 illustrate the structure charts, which show the processes modeled for the pervious land segment module, the impervious land segment module, and the reach/reservoir module, respectively.

Figure H2-6 presents a conceptual model for sediment transport through pervious land segments (or impervious land segments) to reach/reservoir segments. Soil erosion from land segments is simulated by empirical exponential functions of surface runoff from the segments. In the reach/reservoir segments, sediment transport can be simulated by the Colby method, the Toffaleti method, or a user defined method. The user must define the "network" for sediment migrating from land segments to reach/reservoir segments.

Figure H2-7 presents a conceptual model for sediment-associated chemical transport from pervious (or impervious) land segments to reach/reservoir segments. In the OU6 model, chemical transport from a land segment is simulated by a simple linear relationship with the soil eroded from the segment. The fate and transport of a chemical entering or previously stored in a reach/reservoir segment are simulated by processes including advection, decay, deposition/scour, and adsorption/desorption. Processes associated with the dissolved phase of the three modeled contaminants (e.g., hydrolysis, oxidation, volatilization) were not included in the model because they were not considered to be important for radionuclides and antimony which are strongly sorbed to solids. Other water quality processes can be simulated in HSPF (e.g., biological oxygen demand, nitrification), but were not implemented as they are not relevant to the OU6 HHRA.

H2.2.3 HSPF Input Requirements

HSPF requires several types of input data:

- Meteorological data: precipitation, air temperature, dew point temperature, solar radiation, wind speed, potential evaporation, lake evaporation, and cloud cover;

- Hydrologic and hydraulic information such as groundwater seepage; footer drainage; releases from ponds, reservoirs, and tanks; volume-elevation functions and discharge-elevation functions for reach/reservoirs; infiltration rates; groundwater recession rate; Manning's friction coefficient; etc.;

- Physical properties for each segment, including geometric properties (such as area, slope, and length), retention capacities, soil properties, land use, etc.;

- Initial chemical concentrations on the soils within land segments and the sediments within reach/reservoir segments;

For time-varying inputs, the HSPF user defines the time step of each input data set depending on the available data as well as the needs of the particular application. Users must provide "network" information to connect land segments and reach/reservoir segments in order to simulate the hydrologic and transport connection among the elements of the entire watershed. If network information is not provided, each segment in HSPF model will operate as a single computational element independent of the other elements.

H2.2.4 HSPF Outputs

HSPF produces several classes of output:

- Continuous time series. These data are either passed as input to operations further "downstream" in the network or they are recorded on disk in the Time Series Store, or both.

- Run Interpreter output. This is produced as the User's Control Input is scanned and checked and defaults are supplied. It includes an echo of the input, default values supplied by HSPF, and any warnings generated during the run.

- Regular printed summaries. When the simulation time loop begins, data are accumulated for display at an interval specified by the user. The frequency of this output can be varied from once per time step (say 1 hour) to once per year. Regardless of the reporting period, the format of the report is the same. First, the values of all significant state variables (e.g. storage volumes) at the end of the reporting period are given. Then, the fluxes (e.g. flows), accumulated since the preceding report, are summarized. The user can specify whether printout is to be given in English or Metric Units (regardless of the units used for input) or in both systems.

- Special summaries. By using the DISPLAY module, the user may select any time series for special display. For example, he/she may wish to print out the daily average concentration of Total Suspended Solids (TSS) in a reach. In this case, the values (simulated or observed) would automatically be averaged over each day and a year's worth of daily values would appear in a neatly formatted table (suitable for direct inclusion in a report).

- Statistical analysis. Time series can be analyzed for statistical information using the DURANL module.

H2.2.5 Modeling Steps

A successful model requires a thorough understanding of modeling objectives and a well-designed modeling procedure. An HSPF application generally involves the following steps:

- Delineating the watershed and waterbodies into elements. Each element represents a land segment or a reach/reservoir segment.

- Collecting time series of meteorological data, including precipitation, air temperature, dew point temperature, solar radiation, wind speed, potential evaporation, lake evaporation, and cloud cover. These time series are then used to construct the Watershed Data Management (WDM) files for the model.

- Collecting time series of hydrologic data, such as groundwater inputs, footer drainage, releases from reservoirs, etc.

- Collecting physical properties for each segment, including geometric properties (such as slope and length), soil properties, land use, etc.

- Collecting initial chemical concentrations on sediment of both land segments and reach/reservoir segments.

- Collecting information for model calibration, including flow, sediment, and water quality data at gaging stations, and sedimentation rates in reach/reservoirs.

- Check and (if necessary) modify the input data.

- Transferring the information to HSPF input files.

- Running the model.

- Calibrating the model by adjusting input parameters so that model outputs reasonably match observed data.

- Using the calibrated model to simulate future hydrologic and contaminant transport responses of the system.

H3.0
APPLICATION OF HSPF TO THE OU6 SURFACE WATER MODEL

H3.1 REPRESENTATION OF THE OU6 WATERSHED

The OU6 HSPF model domain covers all of the RFETS area that drains to Walnut Creek at Indiana Street, including most of the Industrial Area, the A-series and B-series detention ponds, and the undeveloped land segments that drain to Walnut Creek and its tributaries upstream of Indiana Street. The modeled land segments extend to the west as far as the South Boulder Diversion Canal. It is assumed that runoff from areas west of this canal (which are only about 5% of the entire watershed area) do not reach the Walnut Creek system. All of the OU6 IHSSs are included in this drainage area.

The entire OU6 model domain was divided into the following 52 computational elements (Plate 5.5-2):

- 21 pervious land segments,
- 4 impervious land segments,
- 9 reservoir segments, each reservoir representing a detention pond along Walnut Creek, and
- 18 stream reaches.

In HSPF terminology, both stream reaches and ponds are refereed to as RCHRESs (Reach Reservoirs), thus there are 27 elements labeled with an "R" in Plate 5.5-2. The pervious land elements are labeled with a "P" and the impervious land elements are labeled with an "I." The land segments were delineated to be consistent with the Storm Water Management Model (SWMM) elements of the "Rocky Flats Plant Drainage and Flood Control Master Plan" (EG&G, 1992a). The smaller drainage areas to each of the ponds were selected to be consistent with areas in the "Event-Related Surface-Water Monitoring Report, Rocky Flats Plant: Water Years 1991 and 1992" (EG&G, 1993). These elements were delineated using topographic contours and information on soil characteristics such as infiltration rates.

The connections between HSPF elements are shown in Figure H3-1. The arrows indicate flow directions. As discussed previously, the model is kinematic in the sense that downstream elements have no influence on upstream elements. In this OU6 network, no land segments are downstream of reaches; spills from ponds go straight into the creeks below the dams. The gaging stations shown in the figure are not actually elements in the hydrologic model but are shown to illustrate calibration points. For example, flows through GS10 are illustrated as the surface water outflows (i.e., outflows other than infiltration) from Reach 19.

The number of model elements was appropriate for the amount of data available for calibration and consistent with the objectives of the current modeling study. The Industrial Area, for example, was only divided into three pervious segments (P7, P8, and P14) and four impervious segments (I1, I2, I3, and I4) because there are no gaging data to measure runoff from smaller segments. For future studies, additional computational segments could be added to the existing HSPF model.

The majority of the north side of the Industrial Area (P7 and I2) drains to gaging station 13 (GS13) in Walnut Creek; a small section of the north side of the Industrial Area (P8 and I3) drains to Walnut Creek downstream of GS13. The majority of the south side of the Industrial Area (P14 and I4) drains to GS10 in South Walnut Creek. The rest of the modeled Industrial Area (the solar ponds are not included in the system) is impervious segment I1 which drains to the McKay Bypass Canal.

Nine ponds were included in the HSPF model - the four A-series ponds and the five B-series ponds. The small flow-through pond on Walnut Creek near Indiana Street (known as the W&I Pond) upstream of where Walnut Creek leaves the RFETS eastern boundary was not modeled because of its low storage capacity and the lack of volume data for this pond. Available flow data indicate that this pond has little impact on daily average flows through the downstream gaging station, GS03. For example, the flow data show that the W&I Pond does not attenuate flows between Pond A-4 and the gauging station GS03. The W&I pond is an element that could be added in future modeling efforts.

H3.2 METEOROLOGICAL DATA AND OTHER HYDROLOGIC INPUTS

The HSPF model requires the input of time series data for seven meteorological parameters: precipitation, air temperature, dew point temperature, wind speed, solar radiation, lake evaporation, and potential evapotranspiration. For the long-term model simulations used to predict long-term average concentrations of selected COCs, these meteorological data were simulated using the CLIGEN program discussed in Section H5-2 of this appendix. For the calibration of the model, however, actual meteorological data are required.

For much of the calibration period (April 1986 to August 1993), hourly meteorological data were available from RFETS for precipitation, air temperature, dew point temperature, wind speed, and solar radiation at Rocky Flats. However, there were significant gaps in these data (mostly prior to 1989) that had to be filled prior to input to the OU6 model. For small gaps in the data sets (two hours or less), linear interpolation was performed using the surrounding data. To fill longer gaps in the air temperature, dew point temperature, wind speed, and solar radiation data sets, monthly averages (based on the available record) and observed diurnal variations were employed.

To fill in precipitation gaps greater than two hours, data from other meteorological stations were considered. In the general proximity of Rocky Flats, the two meteorological stations with extensive records of precipitation data are at Stapleton Airport (approximately 25 miles from Rocky Flats) and at the Fort Collins Airport (approximately 60 miles from Rocky Flats). Based on a conversation with Dr. Neil Doeskin of the Colorado Climate Center in Fort Collins, it was decided to use the Fort Collins data to fill in the precipitation gaps. Even though Stapleton Airport is closer to Rocky Flats, Fort Collins and Rocky Flats have the same relative proximity to the foothills of the Colorado Front Range making the Fort Collins climate more similar to the Rocky Flats climate. Using data from the Fort Collins station to fill in data gaps for the RFETS created some uncertainty in the input data for the OU6 model. However, it was believed that this uncertainty was insignificant because the yearly precipitation and rainfall patterns at Fort Collins and RFETS are very similar (Dr. Neil Doeskin, personal communication, 1994).

Pond evaporation and potential evapotranspiration from pervious land segments were calculated by using empirical equations based on actual precipitation, solar radiation, air temperature, and wind speed. Pond evaporation was calculated using an equation developed by Lamoreux (1962) that was calibrated to the Rocky Flats area in an unpublished EG&G study of the Great Western Reservoir. Potential evapotranspiration was calculated with a computer program developed by Advanced Sciences Inc. that uses the Penman FAO-24 Equation (Doorenbos and Pruitt, 1975).

For the nine ponds that were simulated, inputs to the HSPF model include tables relating pond depth to surface area, pond volume, and spillway outflows. Depth/area and depth/volume relationships were estimated based on the 1992 pond survey (Merrick and Company, 1992). Spillway flows as a function of pond depth were calculated using a commonly accepted weir equation (Linsley et al., 1992). For this model, it was assumed that infiltration through the pond bottoms and seepage under the toes of the dams were negligible for the following reasons:

- The dams were constructed from impermeable materials and some of them were keyed to bedrock.

- The terminal ponds are clay lined.

- Unpublished water budget studies of the ponds (conducted by hydrologists at EG&G and Woodward-Clyde for this report) have indicated minimal seepage under the dams as well as minimal infiltration from the ponds.

For the stream reaches in the model, depth/area and depth/volume relationships are required for HSPF to perform hydraulic routing through the creeks and ditches. These relationships were estimated from stream cross section measurements at RFETS. Potential infiltration rates must be supplied by the user for the HSPF model to account for losses from creeks and ditches due to infiltration. These rates were estimated outside of HSPF using a Soil Conservation Service survey (Price and Amen, 1980) and input to the OU6 model. Due to the semi-arid climate at RFETS (evapotranspiration can be as high as 90 percent of precipitation according to Dr. Neil Doeskin, personal communication, 1994), infiltration losses from the creeks and ditches are assumed to evapotranspire and sub-surface flow between creek reaches is considered insignificant. Thus, infiltration losses from the creeks and ditches are lost from the surface water system.

Based on local hydrogeologic information, it was determined that inflow of groundwater from areas outside of the Walnut Creek surface water system (as indicated on Plate 5.5-1) is minimal, and thus no such inflows were included in the OU6 model. The hydrogeologic information does indicate, however, that local groundwater (originating as precipitation on the Walnut Creek watershed) contributes to flows in the creeks and ditches. This flow was included in the OU6 model as was interflow (flow in the unsaturated zone that resurfaces as overland flow). Groundwater flow and interflow that originate from precipitation on pervious land segments are integral parts of the HSPF. Groundwater flow and interflow were allowed to enter the creeks (during and after precipitation events). The model simulates losses from the creeks as evapotranspiration.

Other hydrologic inputs to the OU6 model are effluent from the wastewater treatment plant (WWTP) and drainage from building foundation drains (shown in Plate 5.5-2). Daily records of WWTP flows into Pond B-3 were obtained for January 1992 through July 1994. No variation was observed among the years of WWTP flow data, nor were any monthly trends observed. Thus, the 31 months of daily WWTP data were repeated to generate the seven years of WWTP data needed for calibration and input into the OU6 model.

Baseflow between 0.01 and 0.1 cfs was recorded at GS10 and GS13. Based on discussions with EG&G hydrologists, the most likely source of these flows is building foundation drains. These drains are of two types: (1) a system of trenches and perforated pipes which slope away from the building and use gravity to drain water to a storm sewer or outfall at a lower elevation; (2) a sump and pump system in which water is pumped to a storm sewer or other discharge location. Foundation drains at RFETS are described in more detail in "A Description of Rocky Flats Foundation Drains" (EG&G, 1992b). Time series data based on 1991 through 1993 gaging records were input to the model to simulate these flows and their seasonal variation. Because of the limited amount of gaging data, no variation among years was simulated. Footer drainage in March, April, and May was the same no matter how wet or dry the previous winter was (0.09 cfs). Similarly, footer drainage was consistent from year to year for other seasons: 0.03 cfs in winter and fall and 0.05 cfs in summer.

H3.3 EXTERNAL MODULE TO THE HSPF MODEL: POND OPERATION SIMULATION

The water in the A-series and B-series ponds is regulated for the following three purposes:

- To ensure the water quality in Walnut Creek as it leaves RFETS. Prior to releases from the terminal pond, Pond A-4, water quality is monitored, and, if necessary, a granulated activated carbon treatment system is used.
- To ensure that each pond is kept sufficiently full to keep pond sediments moist and to protect contaminant sediments from wind erosion.
- To protect the structural integrity of the dams for Ponds A-4 and B-5 by keeping the water elevation below certain levels.

Thus, the timing of releases from Pond A-4, Pond A-3, and Pond B-5 depends upon the water quality monitoring schedule and monitoring results in Pond A-4, the minimum capacity requirement for each pond, and the maximum volume requirement for some of the ponds. The operations of these ponds are an important aspect of the Walnut Creek hydrologic system at RFETS, and any model of the OU6 hydrology must incorporate these operations.

As previously discussed, Ponds A-1, A-2, B-1, and B-2 are reserved for flood control and spill control, and water from these ponds seldom enters the Walnut Creek surface water system (rare exceptions could occur during very extreme runoff events). Nevertheless, sediments in these ponds must be kept moist, and, during dry periods, water is sometimes added to these ponds (sources include Walnut Creek, the WWTP, and the Landfill Pond) to keep the volume at or above 10% of the total capacity. Furthermore, Pond B-2 receives some inflow from groundwater in the spring months, and occasionally water enters these ponds from leaks and overflows in the bypasses. These inflows were not included in the pond simulation module for two reasons: (1) These ponds are isolated from most of the watershed (including the other ponds) by bypasses that route runoff around them; (2) The volumes of these inflows are considered very small compared to the overall water budget of the watershed. Thus, the volumes of these ponds (A-1, A-2, B-1, and B-2) are allowed to drop below 10% of their capacities during the HSPF simulation. However, for the calculation of

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concentrations of modeled contaminants, pond volumes were assumed to be at 10% of their respective capacities when the simulated volumes were below this level.

H3.3.1 Summary of Pond Operation Rules

Historically, the objectives of the pond operations were achieved by implementing decisions on a daily basis rather than by following a consistent set of operating rules. However, records of releases are not available for an extended period, and to simulate past operations (for calibration of the model) a set of rules had to be developed. Furthermore, a set of operating rules is necessary to perform simulations of possible future events (for predicting water quality).

Rocky Flats pond operations can be classified into four distinct operational modes: (1) an accumulation period where A- and B- series pond flows are permitted to flow into and be contained by Ponds A-3 and B-5, respectively; (2) transfer of the waters that have accumulated in Ponds A-3 and B-5 to Pond A-4 as the first step leading to discharge of these waters; (3) isolation and sampling of Pond A-4 prior to the discharge of Pond A-4; and (4) the actual discharge of the water in Pond A-4.

For the sake of clarity, it is best to begin the discussion at mode 4, the discharge state. In this state, Pond A-4 is not accepting any inflows or transfers from upstream ponds. The discharge state will continue until the volume of water remaining in Pond A-4 is reduced to 10% of the total capacity. No water is transferred to Pond A-4 during the discharge cycle with the following exception: if the volume in B-5 reaches 80% of capacity, emergency transfer of B-5 water to A-4 is initiated. This is to ensure the structural integrity of the B-5 dam. When the B-5 volume is reduced to 50% of its capacity, the emergency transfer is terminated. Pond A-3 has no critical capacity beyond which structural integrity is threatened, so the pond is permitted to spill.

After A-4 has finished discharging, the volumes of water in Ponds B-5 and A-3 are investigated in this order. If both volumes are below 10% of their respective capacities, no transfer is initiated. If the volume of either or both is greater than 10% of their respective capacities, transfer is initiated to Pond A-4; the levels in Ponds A-3 and B-5 are kept near 10% to provide storage capacity in case of an extreme precipitation event. Transfer of Pond

B-5 water occurs first, and continues until the volume of B-5 is reduced to 10% of its capacity or Pond A-4 fills to 65% of its capacity. Then, if Pond A-4 has not reached 65% of its capacity and transfer from B-5 has finished, transfer of Pond A-3 water is initiated. Pond A-3 transfer is continued until either Pond A-4 reaches 65% of it's capacity or the volume in Pond A-3 is reduced to 10% of its capacity.

After transfers to Pond A-4 are completed, the pond is isolated and samples collected for water quality analysis. The pond remains isolated while samples are analyzed. This waiting period generally ranges from 15 to 20 days, with 18 days being the average time period to obtain the results. The model thus uses 18 days as the sample return time. During the 18 days, the volume in Pond B-5 is monitored to see if the critical override volume is reached (80% as discussed in the discharge state above). If this critical capacity is reached, Pond B-5 transfer is again initiated subject to shutoff at a Pond B-5 volume of 50 percent. Also, at all times volume is monitored in A-4 to ensure that the volume stays below the Pond A-4 critical capacity volume of 80% of maximum volume. If the volume of Pond A-4 reaches 80%, discharge is begun immediately, even if sample results have not been returned (daily comprehensive samples are taken to characterize the discharged waters). Pond A-4 emergency discharge is continued until Pond A-4 volume has been reduced to 10% of capacity.

At this point, the entire discharge cycle is repeated.

H3.3.2 Incorporation of Pond Operation Rules to the OU6 Model

The pond operation rules summarized above indicate that release of water from a pond or addition of water to a pond is controlled by many factors including volume conditions at ponds upstream and downstream of the working pond. Unfortunately, HSPF is not capable of continuously simulating these pond operations, and a separate external program was written for this purpose. For all simulations of the OU6 hydrologic system, including both calibration runs and long-term prediction simulations, the pond operation rules were incorporated and simulated whenever actual pond release data were not available.

At the request of Woodward-Clyde Federal Services, Hydrocomp developed a computer program called PONDSIM (in the Pascal programming language) to simulate the releases of water from Ponds A-3, A-4, and B-5 consistent with the pond operations rules. The following steps describe how PONDSIM and the OU6 surface water model were operated together:

- Run an HSPF simulation that includes the portion of the Walnut Creek watershed that is upstream of Ponds A-3, A-4, and B-5. This portion includes the Industrial Area; Ponds A-1, A-2, B-1, B-2, and B-3; and the areas that drain to these five ponds.

- From this HSPF simulation, obtain the runoff from the area that is upstream of Ponds A-3, A-4, and B-5. This runoff is an input to the PONDSIM program.

- Run the PONDSIM program. PONDSIM produces three time series with binary decision variables for each of the three ponds (A-3, A-4, and B-5): for each hour of the simulation, releases from each pond are either turned "on" or "off" to meet all of the pond operations rules (if that is possible) or to meet the exception rules if there are conflicts.

- After the PONDSIM program produces the three time series of decision variables for pond releases, these become inputs to a new HSPF simulation that models the entire OU6 surface water system including the operation of the ponds.

Besides runoff into Ponds A-3, A-4, and B-5, the inputs to the PONDSIM program are meteorological data; initial pond volumes; and magnitudes of release flows as functions of pond volumes. The meteorological data are the same time series that are input to the HSPF model for the simulation time period. For simulations when pond volume data are not available, initial pond volumes are set at 40% capacity; historical volume data show this to be a reasonable assumption. The relationships between release flows and pond volumes for each of the three ponds are based on two factors: (1) historical flow records which determined average flow rates of releases, and (2) the assumption that release flows are greater when ponds are at higher volumes.

H3.4 SEDIMENT AND WATER QUALITY INPUTS

Inputs to the HSPF model for sediment transport modeling include: soil erosion and washoff coefficients for the pervious and impervious land segments, and bed sediment size and deposition/scour coefficients for the reach/reservoir segments. While most of these inputs are calibration parameters, results of the grain size analysis of pond sediment samples taken during the 1991 field investigation were used to define the pond bed sediment sizes. Sediment grain sizes in the channel reaches were estimated based on professional judgement and model calibration because little field information was available.

The HSPF model is capable of modeling the migration of three general water quality constituents in a single run. In this OU6 surface water modeling study, the migration of three sediment-associated contaminants (Americium-241, Plutonium-239/240, and antimony) was modeled. Adsorption/desorption between dissolved and particulate (sediment) phases was assumed to be minimal (based on the knowledge that the three modeled contaminants are highly associated with sediments), and the adsorption/desorption parameter in the HSPF model was set at the smallest possible value. The chemicals are considered conservative, and chemical reactions such as hydrolysis, oxidation, photolysis, volatilization, biodegradation, and general first order decay for the dissolved constituents were not considered.

In the model, chemical loads from the pervious land segments were assumed proportional to soil loss from the segments. For impervious segments, solids are assumed to accumulate and wash off during runoff events; chemical loads from the impervious land segments were assumed proportional to the mass of solids wasted off during the events. The HSPF model requires the input of initial concentrations of the three modeled contaminants in the surface soil of the pervious and impervious land segments and the initial concentrations in stream/pond sediment for the reach/reservoir segments. These initial concentrations are based on the results of a soil sampling study conducted within the OU6 area.

<u>Chemical Concentrations in Surficial Soils in the Sub-basins of OU6</u>

To a large degree, concentrations of Am-241, Pu-239/240, and antimony in surficial soils in the sub-basins of the OU6 drainage area determine the water quality in Walnut Creek and its tributaries because these chemicals are mostly sediment-associated. Concentrations in surficial soils in each of the OU6 HSPF land segments (pervious and impervious) were estimated based on the area-weighted average concentrations of the IHSS and non-IHSS areas within each segment. Geographic Information System (GIS) software was used to perform these calculations. The average concentrations in the IHSS and non-IHSS areas were based on data presented in Section 4.4 of the main body of this report (as well as Appendix D1) and were estimated as follows:

- Within each OU6 IHSS, the arithmetic mean of all sample concentrations (both measured concentrations and non-detects) was calculated; non-detects were replaced by half of the reporting limit.

- For non-IHSS areas (which were not sampled), concentrations of Americium-241, Plutonium-239/240, and antimony in surficial soils are assumed to be zero; thus the model is only estimating the impacts of OU6 sources on surface water quality and stream/pond sediment.

The calculated average concentrations in each sub-basin are summarized in Table H3-1 and were used as the potency factors (ratio of chemical mass to soil mass loss from the pervious and impervious land segments) in the HSPF input file.

<u>Initial Chemical Concentrations in Reach/Reservoir Sediment in the OU6 Drainage Area</u>

Initial concentrations of modeled contaminants (Am-241, Pu-239/240, and antimony) in reach/reservoir sediments were required as inputs for the water quality simulation in the reach/reservoir segments. Results of the 1992 stream/pond sediment sampling analysis (conducted as part of this Phase I RFI/RI Report) were used to specify the initial chemical concentrations in the reach/reservoir sediments. These concentrations are summarized in Table H3-2; they are based on data presented in Section 4.0 of the main body of this report.

H3.5 DATA SOURCES

The input and calibration data used in the OU6 surface water modeling effort come from these sources:

- EG&G - on-site meteorological data (precipitation, solar radiation, air temperature, dew-point temperature, and wind speed) from 1986 to 1993; flow data from 1991 to 1993; pond volume data from 1990 to 1993; TSS and water quality data from 1986 to 1993; chemical concentrations in surficial soils and stream sediment from 1986 to 1993. These data are in the Rocky Flats Environmental Database System (RFEDS).

- National Weather Bureau - precipitation data for Fort Collins from 1955 to 1989.

- Agricultural Research Service, U.S. Department of Agriculture (National Soil Erosion Laboratory, West Lafayette, Indiana) - the CLIGEN program and the database for a stochastic generation of thirty 30-year meteorological time series of precipitation, solar radiation, air temperature, dew-point temperature, wind direction, and wind speed.

- Previous investigations and studies of RFETS.

- Miscellaneous publications.

H3.6 GENERAL MODELING TASKS

The OU6 surface water flow and transport modeling effort included calibration of the model to measured flow and volume data, observed TSS concentrations, and estimated pond sedimentation rates. Measured concentrations of Americium-241, Plutonium-239/240, and antimony in stream and pond water were used to check the reasonableness of the simulation results. The calibration for flow and TSS concentrations was limited to a five month period (April through August) in 1993 because of the limited record of reliable data at RFETS. (These limitations are discussed in more detail in Section 4.0.) The information on pond sedimentation rates included a much longer period of record (approximately 40 years), and the simulation of sediment transport was calibrated to these pond sedimentation rates for a seven-year period: April 1986 through March 1993. This seven-year period was used because of the availability of meteorological data.

In order to make long term predictions, thirty 30-year simulations were conducted. To account for the variability of meteorological processes, a stochastic weather generator was used to create thirty 30-year time series of meteorological data which simulate the weather patterns of the Denver region. These data were input to the calibrated OU6 surface water model to produce thirty 30-year simulations of creek flows, sediment and contaminant loads, and concentrations of Americium-241, Plutonium-239/240, and antimony in water and sediment. For each of the contaminants and each of the simulations, a 30-year average concentration was calculated. For each contaminant, means, standard deviations, and 95% UCLs were calculated from the thirty 30-year averages. These statistical parameters were inputs to the risk assessment.

A discussion of these tasks is presented in the next two sections.

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H4.0
MODEL CALIBRATION

Calibration of a flow and transport model refers to a demonstration that the model is capable of producing field-measured flows, TSS concentrations, and concentrations of selected chemicals which are the *calibration values*. Calibration is accomplished by adjusting a set of model parameters that produce simulated flows, TSS concentrations, and chemical concentrations that match field measured values within an acceptable range of error or within reasonable limits. There are basically two ways of adjusting model parameters to achieve calibration: (1) manual trial-and-error adjustment of parameters, and (2) automated parameter estimation. This section addresses the calibration of the OU6 HSPF model by the manual trial-and-error method.

There are typically three types of parameters in an HSPF model to calibrate: parameters for flow simulation, parameters for sediment transport simulation, and parameters for water quality simulations. Calibration of the OU6 HSPF model includes:

- Calibration of flow parameters to 1993 flow and pond volume data

- Calibration of sediment parameters to pond sedimentation rates during a seven-years time interval (April 1986 - March 1993)

- Calibration of sediment parameters to the 1993 measured TSS concentration data

Calibration of sediment parameters to measured TSS concentration data was only qualitatively performed because the available data are not suitable for a vigorous model calibration.

The current modeling effort did not include calibration of water quality parameters to match simulated concentrations with measured values within the OU6 drainage system because of the inadequate historical data available for calibration, which is discussed later in this section. Thus only a qualitative evaluation of the modeling concentration results was conducted to see if the predicted concentrations of selected chemicals are within the same ranges as the concentrations measured along Walnut Creek during the seven-year time interval (April 1986 - March 1993).

H4.1 WATER QUANTITY CALIBRATION

The OU6 hydrologic model was calibrated by adjusting HSPF parameters so that simulated stream flows and pond volumes were reasonably similar to observed data. Methods of comparing simulated and observed data were both quantitative and qualitative as discussed in Section 4.1.2. The water budget resulting from the HSPF simulations was also evaluated in terms of consistency with general information about local and regional conditions.

H4.1.1 Available Data and Calibration Targets

Flow Data

Daily average flow data have been measured and recorded for Woman Creek, Walnut Creek, and other locations at RFETS as part of an overall effort to characterize conditions at the site. At several gauging stations, Parshall flumes, weirs, and flow meters have been used for several years. The current stream gaging program began in 1991. (For a more detailed description of the flow-measurement instruments used at RFETS, see EG&G, 1993). The gauging stations which are relevant to the OU6 surface water model - GS03, GS10, GS11, GS12, and GS13 - are shown in Plate 5.5-2. Data on water transfers from Pond B-5 to Pond A-4 are also available for 1989 to 1994.

The data from GS03, GS10, and GS13 were used to measure runoff from the pervious and impervious areas of OU6. Runoff from the northern part of the Industrial Area (P7 and I2 on Plate 5.5-2) is measured by GS13. Runoff from the southern part of the Industrial Area (P14 and I4) is measured by GS10. Flows at GS03, however, also include releases from Pond A-4. Therefore, data from this station include two components: (1) runoff from the predominantly pervious areas that drain to McKay Ditch, the unnamed tributary below the Landfill Pond, and Walnut Creek downstream of Pond A-4, and (2) releases from the A- and B-series ponds which include WWTP effluent, drainage from the plant site (including flows from footer drainage), and local drainage to the ponds. When comparing the observed to the simulated time series of flows at GS03, both of these components should be considered.

The data from GS12, GS11, and transfers to Pond A-4 were used to characterize releases from Ponds A-3, A-4, and B-5, respectively. Thus, for the flow calibration, the pond simulation program described in Section H3.3 of this appendix was not employed because actual records of pond releases were available.

Unfortunately, much of the flow data are not in RFEDS or have been determined to be unreliable according to EG&G hydrogeologists:

- The data collected prior to the current program (i.e., prior to 1991) are not in RFEDS, are limited to few sampling locations, and are of questionable accuracy.

- Some of the data collected during the current program (before April 1993) are considered relatively inaccurate because the gaging equipment was not consistently calibrated before that time.

- Winter records are not reliable because of ice in the flumes, and also because gaging equipment is sometimes turned off during cold periods to prevent damage to the equipment.

The gaging data for water year 1994 were not available before this modeling effort was completed. Therefore, the only reliable gaging record was for April through September 1993. Because of gaps in the meteorological data, September 1993 was not included in the calibration period. Thus, the time period for flow calibration is April through August 1993. The total precipitation during this time period is 5.3 inches which is approximately 30% of the average annual precipitation at RFETS. Even with this short time period of five months, some of the data are missing from the record (the GS13 record, in particular, is missing data for April 11 - 13 and May 10 - June 22 which would include flow data for many of the larger storms of 1993), and some data are considered less accurate: for GS10 and GS13 the flumes are overtopped during runoff events when precipitation exceeds approximately 0.5 inches.

Volume Data

For the April 1993 through August 1993 time period, pond releases are known, and the model was run without the PONDSIM program. Thus, the volume in Pond A-3 was used as a measure of runoff from the northern part of the plant site (runoff from this area is diverted around Ponds A-1 and A-2 and into Pond A-3). The use of Pond A-3 volume data was necessary for calibrating this section of OU6 since, as mentioned previously, much of the GS13 flow data are missing during this time period, particularly during larger precipitation events. Volumes in Pond B-5 were not used to measure runoff from the southern part of the plant site because flows into this pond (via Ponds B-3 and B-4) are dominated by effluent from the WWTP, and runoff from precipitation events is a very small (often undetectable) fraction of changes in the pond volume. Furthermore, the data from GS10 (which measures runoff from the southern part of the Industrial Area) are more extensive than the data from GS13.

H4.1.2 Calibration Parameters for Pervious and Impervious Segments

For the pervious land segments, the most important calibration parameters are the following (parameters are not listed in order of importance but rather from surface processes to groundwater processes):

Shade (SHADE) - This parameter is the fraction of a land segment shaded from solar radiation by, for example, trees. It significantly effects the rate of snow melt.

Snow condensation/convection factor (CCFACT) - This parameter is used to adjust snow melt values to observed field conditions (snowpack depth and/or runoff flows).

Infiltration (INFILT) - This parameter is an index to the mean infiltration rate on a land segment. Values depend on the cohesiveness and permeability of the soil and can be initially estimated from SCS soil categories. Infiltration can be adjusted monthly or seasonally to account for frozen ground in the winter.

Interflow (INTFW) - This parameter affects runoff timing by creating interflow and decreasing surface runoff. It is a sensitive parameter and greatly influences hydrograph shape. This parameter can be adjusted monthly or seasonally.

Interflow recession constant (IRC) - This parameter is the ratio of interflow on any day to interflow 24 hours earlier. This parameter can be adjusted monthly or seasonally.

Upper zone nominal storage (UZSN) - This storage of water in the unsaturated zone depends on the capacity of the soil to store water and the tendency for the storage to be used (the hydraulic conductivity of the soil). It is also influenced by surface topography and vegetation. This parameter can be adjusted monthly or seasonally.

Lower zone nominal storage (LZSN) - As with upper zone storage, this storage of water in the unsaturated zone depends on the capacity of the soil to store water and the tendency for the storage to be used. These factors are related to soil properties as well as the relative amount of precipitation. This is the main calibration parameter for matching observed runoff volumes.

Lower zone evapotranspiration fraction (LZETP) - This is a measure of the amount of deep rooted vegetation within a watershed segment. This vegetation draws water from the lower zone of the unsaturated soil. This parameter can be adjusted monthly or seasonally.

Active groundwater evapotranspiration fraction (AGWETP) - This value indicates the fraction of remaining potential evapotranspiration (after being drawn from other sources of potential evapotranspiration) that can be satisfied from active groundwater storage.

Active groundwater recession constant (AGWRC) - This highly sensitive calibration parameter is used to match the shape of a hydrograph - particularly the tail end of an event hydrograph when the source of flows in the stream are essentially groundwater seepage. The higher this constant, the flatter are event hydrographs for a given land segment.

Baseflow evapotranspiration fraction (BASETP) - This is the fraction of potential evapotranspiration that can be satisfied from baseflow (groundwater outflow). It simulates evapotranspiration during baseflow, for example, as might occur from riparian vegetation.

Deep groundwater fraction (DEEPFR) - This is the fraction of groundwater inflow that will enter deep (inactive) groundwater and is lost from the surface water system.

For the impervious land segments, there are very few parameters, and only one, retention storage, was used for calibration. Retention storage refers to the quantity of water that is detained by such things as clogged gutters and low points on parking lots and drainage channels. This water is assumed to evaporate rather than become surface water runoff from the segment.

Initial calibration parameters were estimated using guidance literature provided by the EPA (Bicknell, et al., 1993) and Hydrocomp, Inc. (unpublished handouts provided during a short course on the use of HSPF, May 1993) and by considering local site conditions.

These initial parameters were assigned to all of the pervious and impervious segments of the OU6 model and then adjusted (with the trial and error method) during calibration:

- The parameters for the segments on the north side of the plant site (P7, P8, I2, and I3 on Plate 5.5-2) were adjusted so that simulated volumes in Pond A-3 reasonably matched observed volumes as discussed in Section H4.1.3.

- The parameters for the segments on the south side of the plant site (P14 and I4 on Plate 5.5-2) were adjusted so that simulated flows reasonably matched observed flows at GS10;

- Parameters for the six pervious land segments and one impervious segment (P1, P2, P3, P4, P5, P6, and I1 on Plate 5.5-2) that drain to Walnut Creek at Indiana Street without flowing through the pond system were adjusted to try to reproduce observed flows at GS03;

- The parameters for segments that could not be adjusted in the calibration process were assumed to be the same as the adjusted parameters for similar or neighboring segments.

Two methods were employed for comparing observed data to simulated flows and volumes:

Quantitative comparisons - Sum the simulated average daily flows to obtain the total simulated flows at GS03 and GS10 for the five month period (April to August 1993) and calculate the percent differences between observed flow volumes and simulated flow volumes for the two locations. For Pond A-3, calculate the percent difference between the observed change in pond volume and the simulated change in pond volume over the five-month period.

Qualitative comparisons - Plot the time series of the observed and simulated flows and volumes. Observe the graphs to determine if the simulated hydrographs and changes in storage are similar in shape and temporal occurrence to the measured data. In particular, check the timing and magnitudes of runoff peaks.

The two types of comparisons were performed simultaneously. After each adjustment of model parameters, simulated volumes were compared for observed volumes and graphs of simulated hydrographs were compared to observed hydrographs.

H4.1.3 Calibration Results

Calibrated Parameters

The calibrated parameter values which are listed in the example computer input file in Attachment B all fall within the ranges suggested by the guidance literature. The infiltration parameter can also be compared to known information about local site conditions. The calibrated value of 0.06 inches per hour is within the range of estimated permeabilities of OU6 soils. The range for most of the soils in Walnut Creek, Mckay Ditch, and No Name Gulch is 0.06 to 0.2 inches per hour (Price and Amen, 1980).

Calibration Comparisons

The HSPF model simulated a total flow volume of 183 acre-feet at GS03 for April through August 1993 (excluding May 18 through May 28 when the record is unreliable). The observed total flow volume for this time period is 176 acre-feet. The difference between these values is 4 percent of the observed flow volume which is considered a very good calibration in the HSPF guidance literature (Donigian, et al., 1984). Since much of the flow at GS03 comes from releases from Pond A-4, the simulation of storm runoff is not as accurate as this low percent difference might indicate. Nevertheless, this percent difference was considered within a reasonable range of error given the short record of reliable gaging data.

Figure H4-1 shows observed and simulated flows at GS03 for the five-month time period (observed data were not reliable for May 18 through May 28 and were not plotted on the figure). To improve the clarity of the beginning of the simulation, the flows during April were also plotted separately on Figure H4-2. Both of these figures also show releases from Pond A-4 as well as precipitation to help distinguish between the sources of runoff at GS03. These figures indicate:

- During periods of release in which there was very little precipitation and virtually no runoff (e.g., July 24 through August 12), the releases were higher than flows at GS03 because of infiltration in Walnut Creek downstream of Pond A-4. For these time periods the model fits the observed data very well, and it is difficult to distinguish the observed from the simulated flows on the figure.

- After large precipitation events (e.g., April 12) the flow at GS03 is greater than releases from the pond. Although the runoff was sometimes over-simulated and sometimes under-simulated, the model reasonably reproduced the flows at GS03.

The total flow volumes at GS10 for the five-month period (excluding flows on days when the record is unreliable, that is May 7 through 10 and June 17 through 18) are 22.8 acre-feet for the observed flows and 24.6 acre-feet for the simulated flows. The difference between these values is 8 percent of the observed flow volume. In the guidance literature, less than 10 percent difference is considered very good (Donigian, et al., 1984, page 114).

Figure H4-3 shows observed and simulated flows at GS10 for the reliable record of the five-month period. Precipitation is also included on the figure. Unfortunately, the data gap in June occurred during the largest runoff event of the period; the large simulated peak of June 17 and 18 could not be compared to observed data. The two sources for most of the runoff to this gaging station are drainage from building footer drains and runoff from impervious areas on the south side of the plant. The effect of the footer drainage is shown in the figure as approximately 0.1 cfs during April and approximately 0.05 cfs after April. These flows were accurately simulated by the HSPF model. The peak flows from impervious runoff were not as well represented. The impervious segments of the HSPF model have only one significant calibration parameter, retention storage (the amount of impervious area was considered fixed and the model was not very sensitive to the Manning's roughness coefficient). The calibrated value for retention storage resulted in an under estimation of the small runoff events (some of these smaller events resulted in no increase in simulated runoff above baseflow while the observed runoff was twice the baseflow) and an over estimation of some of the larger events (for example, on May 17 the simulated flow is 33 percent greater than the observed flow). Although the limited data prevented a more comprehensive comparison between observed and predicted peak flows over a large range of conditions, the sediment transport calibration (Section 4.2) indicated that the model peak flows appeared to be reasonable.

For calibration of the HSPF segments that represent the north side of the plant, volume data for Pond A-3 were used. The observed change in volume from April 2 to August 30 is a decrease of 20.3 acre-feet. The simulated change during this time period is a decrease of 19.9 acre-feet. The difference between these values is 2 percent of the observed volume change. This percent difference shows a very good representation of volumes in the pond (Donigian, et al., 1984). This good comparison between observed and predicted volumes is not necessarily indicative of a good runoff simulation because the volume in Pond A-3 is mostly driven by upstream releases which are input to the model. Figure H4-4 illustrates a reasonable simulation of Pond A-3 volumes, although the volumes are sometimes underestimated (e.g., April 14 and May 9) and sometimes overestimated (e.g., April 21 and June 20).

H4.1.4 Flow Simulation for the Seven-year Sediment Calibration

Hydrologic Simulation

A seven-year flow simulation from April 1986 to March 1993 was conducted to provide hydrologic inputs to the pond sedimentation rate calibration for the same period. The simulated flow results were not compared with measured stream flow data because only a few flow measurements were taken during this time interval. Furthermore, the simulation could not be calibrated to observed pond volumes because the PONDSIM program (which assumes certain operational rules that were not necessarily followed during this period) was used. However, the simulated flows and volumes in each detention pond are within typical ranges of the available observed data. A water budget analysis was also performed to check the reasonableness of the model predictions.

The preparation of the synthetic meteorological and hydrologic inputs for the seven-year simulation is discussed in Sections H3.2, H3.3, and H3.4 of this appendix, including the input of releases from the WWTP and footer drainage, and the incorporation of the pond operation simulation.

Water Budget Analysis

Using the results of the seven-year HSPF simulation of the OU6 hydrologic system, a water balance was conducted to compare HSPF results to known information about the local hydrologic conditions. For water years 1987 through 1992, HSPF results are shown in Table H4-1. The annual averages of these parameters over the six water years are also illustrated in Figure H4-5.

The percentage of precipitation lost from the surface water system through infiltration to groundwater is low (79.0/2070.0 = 4%) and is consistent with available hydrogeologic information.

The percentage of precipitation lost to evapotranspiration is high (1905.0/2070.0 = 92%) and is consistent with local and regional site conditions which indicate that only a very small percentage of the precipitation becomes surface runoff at RFETS (Hurr 1976). To further illustrate the small amount of surface runoff predicted by the HSPF simulations, estimated flow in Walnut Creek at Indiana Street was compared to total precipitation. To make this comparison, WWTP flows were removed from the system. The flow in Walnut Creek at Indiana Street due to WWTP flows can be estimated by subtracting evaporation and increases in pond volumes from the WWTP flows. This calculation (176 ac-ft minus 42 ac-ft minus 1 ac-ft) yields a flow of 133 ac-ft. Thus, an estimate of the flow due to runoff is 142 ac-ft (275 minus 133), or 7% of total precipitation.

H4.2 SEDIMENT TRANSPORT CALIBRATION

The sediment transport calibration process involved 2 steps: calibrating the model to measured TSS concentrations at selected sampling stations along Walnut Creek and its tributaries and calibrating the model to estimated pond sedimentation rates in the A- and B-series ponds. Calibration to pond sedimentation rates took precedence over calibration to measured TSS concentrations because the TSS data available are limited and was not considered as reliable as the pond sedimentation rates.

H4.2.1 Calibration Parameters

The most important calibration parameters for HSPF sediment transport modeling are the following:

<u>PERLND Segment</u>

Soil detachment parameters (KRER, JRER) - These parameters are used to determine how much of the soil matrix can be detached by falling rain and thus becomes available for washoff.

Soil washoff parameters (KSER, JSER) - These parameters are used to determine how much of the detached soil can be washed off the pervious land segment by surface runoff.

Soil scour parameters (KGER, JGER) - These parameters are used to determine how much of the soil matrix can be scoured and removed from the land segment by runoff.

<u>IMPLND Segment</u>

Atmospheric deposition rate (ACCSDP) - This parameter is used to determine the quantity of solids deposited on impervious land segments from atmospheric deposition and artificial accumulation (e.g., sanding of roads during snow fall events).

Solids washoff parameters (KEIM, JEIM) - These parameters are used to determine the amount of solids to be removed from impervious land segments by surface runoff.

RCHRES Segment

Bed material grain size (D_{50}) - This parameter is used to determine the resistance of sediment (sand) from removal by stream flow. It is only required if either the Colby method or Tofaletti method is used in sediment transport modeling. Sediment grain sizes in the ponds and creeks are based on the results of grain size analysis of sediment samples taken from the creeks during a 1991 survey (because the sample locations are immediately upstream of the ponds, it was assumed that these samples are roughly representative of sediment grain sizes in creeks and ponds), on professional judgement, and model calibration as discussed in Section H4.2.2.

Sediment transport capacity coefficients (KSAND, EXPSAND) - These parameters are used to determine the sediment transport capacity of the stream flow. They are required with the power sediment transport function but not with the Colby method or Tofaletti method.

Critical shear stress for deposition of silt and clay (TAUCD) - This parameter is used to determine when deposition of silt and clay occurs in a stream or pond segment.

Critical shear stress for scour of silt and clay (TAUCS) - This parameter is used to determine when scour of silt and clay occurs in a stream or pond segment.

Scour coefficient for silt and clay (M) - This parameter is used to determine how fast deposited silt and clay can be scoured if scouring occurs.

H4.2.2 Grain Size Distribution of Stream/Pond Sediment

Seven soil samples were taken from the OU6 drainage area in 1991 for grain size analysis. While most of the samples were taken from surficial soils of the pervious land segments, two samples were taken from the stream sediment just upstream of the detention ponds. The results of these samples were used as the starting grain size distribution of sediment in the creeks and ponds for the model calibration. The final grain size distributions (used for model predictions) were determined through model calibration to sedimentation rates as well as to physical observations of the material in the creek beds. The grain size distribution for these two samples is presented in Figure H4-6. As shown in this figure, the median sediment size,

D_{50}, defined as the particle size for which 50% of the sediment is finer by weight, is approximately 1.2 mm or 0.045 inch.

H4.2.3 Calibration Values (Measured Data)

TSS Concentration

EG&G Rocky Flats has collected water samples from Walnut Creek for TSS concentration analysis. These samples were generally taken sporadically and the majority of the samples were taken from baseflow. A continuous record was not available. These data are listed in Attachment C and summarized as follows:

- 23 locations were sampled (shown on Figure H4-7).
- A total of 960 samples were collected from these 23 locations,
- The majority of the samples were taken from the detention ponds,
- The maximum TSS concentration is 21,500 mg/L detected at location SW69093.
- The majority of the samples taken from the ponds are non-detects,
- TSS concentrations measured at Indiana Street (SW003) are low, varying from non-detects to 35 mg/L. These samples are mostly from baseflow.

During the flow calibration time interval in 1993, TSS data are very limited. Only 19 samples are available. These data are summarized in Table H4-2.

Since most of the TSS data are from baseflow and a continuous record of data during a storm event is not available, these TSS data were generally considered not adequate for model calibration. Thus comparison between the predicted and the measured TSS concentrations is only qualitative. It is recommended that continuous TSS concentration data be collected in the future for a more rigorous model calibration.

Total Pond Sediment Deposit

Since the 1950s, a series of dams have been built on the South and North Walnut Creeks for flood control and water quality management. These dams form the A-series and B-series ponds which trap sediment coming from the upstream pervious and impervious land segments. The sediment deposited in these ponds provides valuable information for model calibration by comparing the simulated pond sedimentation rates to the measured sedimentation rates during a certain time interval. The following paragraphs discuss the determination of total deposition in the ponds and the calculation of sedimentation rates within the seven-year calibration time interval.

A conceptual model to describe the sediment deposition pattern in ponds is illustrated in Figure H4-8. The total volume of sediment deposited in a pond is calculated as:

$$V = C_d(A \cdot D) \tag{1}$$

where	V	=	total sediment deposit in ft^3 or acre-ft,
	A	=	surface area of deposit in ft^2 or acres,
	D	=	average depth of deposit along the trough (deepest) line,
	C_d	=	shape coefficient.

The total weight of sediment deposited is then calculated as;

$$W = \rho_s V \tag{2}$$

where ρ_s = the specific weight of wet sediment in the pond, lbs/ft^3. For sediment deposit in lakes and reservoirs, ρ_s generally varies from 30 lbs/ft^3 to 150 lbs/ft^3, depending on the particle size distribution, the content of organic matter, water temperature, porosity , and time (Vanoni, 1975). In this study, a value of 75.4 lbs/ft^3 (1.21 g/cm^3) was used, based on Lane and Koelzer's study (1953) and assuming that 80% of the sediment deposit in the pond is clay and silt.

The shape factor C_d depends on the cross-sectional shape of the sediment deposit. For a perfectly triangular cross-sectional deposit, C_d equals 0.5. In this study, a value of 0.5 was used.

The average total depth of deposit in each pond was estimated from the 1992 pond sediment sampling survey (conducted as part of this Phase I RFI/RI Report). In June 1992, sediment samples were taken from each of the A- and B- series ponds for analysis of volatile organic compounds, semi-volatile organic compounds, total organic carbon, radionuclides, and metals. Four sediment samples along the center portion of each pond were taken. Since these core samples reached the bottom of the deposit, the total depth of each sample represents the total sediment deposit at that particular location. These data are summarized in Table H4-3. The average value of core depths in each pond was assumed to be the average total depth of sediment deposit along the center line of the pond.

The surface areas of deposit were estimated from recent survey maps (Merrick, 1992) developed for the OU6 surface water drainage area. The results are presented in Table H4-4 (Column 4).

To calculate the annual average sedimentation rate in each pond, the construction dates for each pond were required. These dates are available in the Pond Water Management Interim Measures (EG&G, 1994) and the years of construction are given in Table H4-4 (Column 2).

Using the data discussed above, the total and annual sediment deposit in each detention pond were determined by applying Equations 4-1 and 4-2. The results are presented in Table H4-4.

<u>Pond Sedimentation Rates during the Seven-year Calibration Time Interval</u>

The total sediment deposit calculated in Table H4-4 represents the sediment deposited from construction of the pond until 1992. These values, however, cannot be directly translated to obtain the total sediment deposited within the seven-year calibration time interval (April 1986 - March 1993) because sediment deposition in each pond varies annually with weather conditions. A wet year produces more surface runoff than a dry year and thus produces more soil erosion from the overland area. Thus more sediment is deposited in each pond during a wet year than during a dry year, assuming that the majority of the soil loss from the overland area is deposited in the detention ponds.

Soil loss from overland areas is a very complicated phenomenon (Vanoni, 1975; Julien and Frenette, 1985; Lane and Nearing, 1989; etc.). The Universal Soil Loss Equation (USLE) (Wischmeier and Smith, 1960) relates the soil loss to the kinetic energy of rainfall while many other researchers look at sediment production as a function of surface runoff (Vanoni, 1975, Julien and Frenette, 1985). While rainfall and runoff can generally be described as a power relationship (Linsley et al., 1992), it is then reasonable to assume that soil loss from surface runoff due to rainfall can be described as a power function of the rainfall intensity of each storm,

$$q_s = KI^{\beta}(\Delta T) \tag{3}$$

where

where	q_s	=	total soil loss from an overland area during a single storm, in volume/hour or weight/hour,
	I	=	average rainfall intensity of the storm, cm/hour or inches/hour,
	ΔT	=	duration of the storm, hours,
	β	=	soil erosion exponent,
	K	=	soil loss coefficient.

The soil erosion exponent β is a complicated parameter depending mainly on site soil and canopy cover conditions. While it generally varies from 1.0 to 3.0, its value can only be determined from measured data on the site. In this study, however, data to determine this parameter are not available. A value of 1.7 for β was assumed for the following reasons:

- It represents the geometric mean of 1.0 and 3.0.

- It is the same as the soil washoff coefficient (JSER) for the pervious land segments and the solid washoff coefficient (JEIM) for the impervious land segment, which were calibrated to measured TSS concentrations. Since these two coefficient (JSER and JEIM) are the exponents in the power relationship between soil (or solid) washoff and surface water runoff from the segment, parameters β and coefficients JSER and JEIM have similar meanings.

The total soil loss from an overland area during a certain time period with N storm events is:

$$Q_s = K\sum_{i=1}^{N} I_i^{\beta}(\Delta T)_i \qquad i = 1, 2, \cdots, N \tag{4}$$

Therefore the total sediment deposit in each pond during the seven-year calibration time interval can be approximately estimated by the following equations:

$$Q_{s1} = \alpha\, Q_s \tag{4-5}$$

$$\alpha = \frac{\sum_{j=1}^{M} I_j^{\beta}(\Delta T)_j}{\sum_{i=1}^{N} I_i^{\beta}(\Delta T)_i} \qquad (i = 1, 2, \cdots, N; j = 1, 2, \cdots, M) \tag{4-6}$$

where Q_{s1} = total sediment deposited in each pond during the seven-year calibration time interval,

Q_s = total sediment deposited in each pond from construction of the pond to approximately 1992,

M = number of storm events in the seven-year interval,

N = number of storm events from the year of construction of the pond through 1992.

To calculate the total sediment deposited in each pond during the seven-year calibration using Equations 4-5 and 4-6, two additional minor assumptions were made:

(1) The total sediment deposited in each pond from April 1986 to March 1993 equals the total sediment deposited from January 1986 to December 1992 (a shift of three months). Then the M value in Equation 4-6 represents the total number of storm events in the seven-year interval from January 1986 to December 1992 instead of from April 1986 to March 1993. It is believed that this assumption would only slightly affect the results of the pond sedimentation rate for the seven-year calibration time interval.

(2) The total sediment deposited in each pond from construction of the pond to July 1992 when the sediment sampling took place is assumed to represent the total deposit from construction of the pond through December 1992 (that is, the trap efficiency is assumed to be 100 percent). The N value in Eq. 4-6 represents the total number of storm events from the year of construction of the pond through 1992.

With these two assumptions and Equations 4-5 and 4-6, the total sediment deposited in each pond from January 1986 to December 1992 was calculated. The total sediment deposited in each pond for the seven-year calibration time interval (from April 1986 to March 1993) was then assumed to be equal to that from January 1986 to December 1992.

Using the precipitation data from RFETS (1986 - 1994) with data gaps (mostly prior to 1989) filled by the precipitation data from the Fort Collins station, the coefficient α can then be determined. The total sediment deposit within the seven-year calibration time interval is then calculated by using Equation 4-5. The results are summarized in Table H4-4 (Columns 9, 10, 11).

H4.2.4 Calibration Procedures

After the HSPF model was calibrated for its flow component, the sediment transport component was calibrated. Sediment transport calibration was accomplished by adjusting the sediment-related parameters discussed in Section H4.2.1 such that simulated TSS concentrations and pond sedimentation rates matched field measured values within a reasonable limit. The important adjustments were to the solids washoff coefficients from the impervious land segments and the sediment grain sizes of channel bed materials. Calibration targets included:

(1) Matching the simulated TSS concentrations with the observed TSS concentrations at selected locations along Walnut Creek within the 1993 flow calibration time interval (April - August);

(2) Matching the simulated with the estimated total sediment deposits in each of Ponds A-4 and B-5 during the seven-year calibration time interval (1986 - 1992);

(3) Matching the simulated with the estimated total sediment deposits in "pooled" ponds during the seven-year calibration time interval (1986 - 1992), including:

- Total of ponds A-1, A-2, and A-3;
- Total of A-series ponds (A-1, A-2, A-3, and A-4);
- Total of ponds B-1, B-2, B-3, and B-4;
- Total of B-series ponds (B-1, B-2, B-3, B-4, and B-5).

Total sediment deposits in "pooled" ponds (as opposed to individual ponds) were used for model calibration because by pooling the ponds, the effects of the somewhat uncertain operation rules become less important in the calibration. As discussed in Section H3.3.1, routing of surface water through the A- and B-series ponds in the OU6 model is dictated by a set of pond operation rules. These rules may differ from past pond operating procedures. For example, surface runoff from the northern part of the Industrial Area bypasses ponds A-1 and A-2 because this water is routed through pipes to pond A-3. A similar bypass routes runoff from the southern part of the Industrial Area around ponds B-1 and B-2. Thus ponds A-1, A-2, B-1, and B-2 are isolated from the Walnut Creek System in the OU6 model, and very little sediment (from local runoff only) reaches these ponds in the model simulation. However, the actual historical diversion of runoff (and sediment) around the ponds is uncertain; according to EG&G hydrologists there have been few times when runoff from the Industrial Area was routed to Ponds A-1, A-2, B-1, and B-2 (to keep the sediments moist). This uncertainty makes the comparison of simulated and estimated sediment deposits in individual ponds (especially Ponds A-1, A-2, B-1, and B-2) less useful for calibration purposes. Therefore, total sediment deposits in "pooled" ponds were used for comparison in the model calibration. The total sediment deposited in the A-series ponds represents the total soil loss from the northern part of the Industrial Area, and the total sediment deposited in the B-series ponds represents the total soil loss from the southern part of the Industrial Area.

H4.2.5 Calibration Results

A comparison between simulated and estimated pond sedimentation rates is given in Table H4-5. The prediction errors for the targeted ponds in Table H4-5 are:

Single or "pooled" ponds	Prediction Error (%)
A-1 to A-3	5.5
A-1 to A-4	2.6
B-1 to B-4	7.0
B-1 to B-5	-0.4
A-4	-16.4
B-5	-37.2

The results indicated that sedimentation rates in ponds A-1, A-2, B-1, B-2, and B-3 are significantly under-predicted as anticipated because of the difference between actual pond operation in the past and the pond operation simulated in the model (See Section H4.2.4). The prediction errors for the targeted ponds, however, are relatively small, indicating that the OU6 HSPF model was well-calibrated in term of sediment transport. The prediction errors seem quite acceptable considering that the actual pond operation decisions might have been significantly different than the pond operation rules in the OU6 model.

As a further check on the sediment transport model, a comparison between the predicted and measured TSS concentrations along Walnut Creek during the 1993 calibration time interval (April - August) is given in Table H4-6. As discussed earlier in Section H4.2.3, this comparison was only meant to be qualitative because of the inadequacy of the historical TSS data for calibration. As it is indicated in Table H4-6, a considerable prediction error was observed. However, the predicted TSS concentrations are mostly within the same order of magnitude as the measured TSS concentrations.

Values of the calibrated parameters can be found in the example computer input file for the seven-year sedimentation calibration in Attachment B. Table H4-7 lists values of some of the more important parameters.

H4.3 REASONABLENESS CHECK OF WATER QUALITY MODEL PREDICTIONS

Although a large number of water quality samples have been collected from Walnut Creek, its tributaries, and the detention ponds in the last 10 years, most of these samples were taken intermittently and under baseflow conditions. Because a continuous record of data during one or multiple storm events is not available, these concentration data were considered inadequate for model calibration. It is recommended that more extensive water quality data be collected in the future for a more rigorous model calibration.

Although they were not used for calibration, these data were used for a qualitative check of the model prediction results. Historical analytical results for Plutonium-239/240 and Americium-241 in the water column are given in Attachment D and summarized in Table H4-8. Results for antimony are not given because antimony was not detected in the water phase. Sample locations are shown on Figure H4-7.

<u>Reasonableness Check of Simulated Creek Concentrations</u>

For the seven-year calibration time interval (April 1986 - March 1993), the distributions and averages of simulated hourly concentrations of Am-241 and Pu-239/240 are shown in Table H4-9 for three reaches in the Walnut Creek watershed. Locations of these reaches are shown on Plate 5.5-2. Sample data collected in 1993 were discussed in Section H1.3 and presented in Table H1-1; 1993 sample locations are shown on Plate H1-1.

Reach 8 is near SW017 of the historical sample locations and near SW67393 (baseflow) and SW69393 (storm runoff) of the 1993 sampling locations. During the seven-year simulation, concentrations of Am-241 and Pu-239/240 in the water column of Reach 8 were never greater than 0.0 pCi/L. Compared to the historical data and 1993 data, this indicates a reasonable simulation of radionuclide activity during baseflow conditions, but an underestimation of radionuclide activities during storm events. However, given the error involved in measuring radionuclide activities, this underestimation is not considered significant. Furthermore, data was available for runoff volumes and pond sedimentation rates, and these parameters were used for calibration of contaminated loads into Reach 8.

Reach 9 is near SW092 where historical samples were obtained and near SW68193 (baseflow) and SW69093 (storm runoff) of the 1993 sampling locations. As with Reach 8, simulated baseflow concentrations of the two radionuclides are near 0.0 pCi/L. The historical and 1993 data indicate that this is reasonable. The storm data from 1993 from SW69093 include concentrations of 2.8 pCi/L and 10.85 pCi/L for Am-241 and Pu-239/240, respectively. This Am-241 value is within the range of simulated values (99% of the simulated Am-241 concentrations are less than 10 pCi/L). The Pu-239/240 concentration is above the majority of simulated concentrations. Concentrations at SW092 were not measured above 0.047 pCi/L for Am-241 or 0.602 pCi/L for Pu-239/240. The simulated results appear to be reasonable compared to the measured data.

Reach 19 is near SW061 of the historical sample locations and near SW67593 (baseflow) and SW68893 (storm runoff) of the 1993 sampling locations. Baseflow concentrations for this reach are higher than for Reaches 8 and 9, but are still very small (most are less than 0.01 pCi/L). The 1993 data for baseflow at SW67593 are also very small (0.003 pCi/L for both radionuclides). The maximum simulated concentrations for both radionuclides are smaller than the maximum observed concentrations indicating an undersimulation of loads into this reach. However, this reach was calibrated for runoff flows and sedimentation rates in downstream ponds, and runoff and soil erosion are considered to be reasonably represented.

<u>Reasonableness Check of Simulated Pond Concentrations</u>

For the seven-year calibration time interval (April 1986 - March 1993), a comparison between the simulated and the measured concentration ranges in pond water is summarized in Table H4-10. The simulated concentrations of Am-241, Pu-239/240, and antimony in pond water were comparable to the measured concentrations except for Ponds A-1, A-2, B-1 and B-2 where the simulated maximum concentrations seemed much higher than the measured maximum values.

For Ponds A-1, A-2, B-1 and B-2, unusually high concentrations of the three modeled contaminants were predicted in the model when the pond water volume in the model drops to a certain level (generally less than 1% of the pond capacity). This phenomenon is mainly the result of two assumptions made in the OU6 model:

- In the model, a small portion of the sediments entering the stream and the ponds was not allowed to settle. This assumption was made to permit: (1) a more accurate TSS concentration calibration downstream of the detention ponds; and (2) a more realistic simulation of measured concentrations of Am-241, Pu-239/240, and antimony in the ponds when there is no outflow from the ponds and the ponds are not close to being empty.

- In the model, water volumes in ponds A-1, A-2, B-1, and B-2 were allowed to drop below 10% of their capacities in contrast to the actual situation in which capacities are kept at or above 10% capacity (see explanation in Section H3.3).

As a results of these assumptions, the chemical concentrations increase as the volumes in Ponds A-1, A-2, B-1, and B-2 decrease while the amount of suspended sediment in the ponds remains the same. Thus, when volumes in ponds A-1, A-2, B-1, and B-2 dropped to a certain level (e.g., less than 10% of their capacities) during the seven-year simulation, the concentrations of Americium-241, Plutonium-239/240, and antimony in the water in these ponds were over-estimated.

Because the difference between the pond operations simulated in the model and the actual pond operations is the largest for Ponds A-1, A-2, B-1, and B-2, the results for these ponds are not as accurate as the estimated concentrations for Ponds A-3, A-4, B-3, B-4, and B-5. However, the estimated concentrations of Am-241, Pu-239/240, and antimony in the pond water were believed to be conservative because the estimated concentrations are in general higher than the historical values (Table H4-10).

H5.0
PREDICTIONS OF LONG-TERM AVERAGE CONCENTRATIONS

The final task of the OU6 surface water and transport model was to estimate the future concentrations of Am-241, Pu-239/240, and antimony along Walnut Creek and its tributaries in support of human health and ecological risk assessment for the OU6 Feasibility Study. For the human health risk assessment, this entails estimating long-term average concentrations of contaminants in stream flow and in sediment in the ponds and in Walnut Creek at Indiana Street. These estimates are based on the results of thirty 30-year simulations. This section discusses the generation of thirty 30-year meteorological time series and the results of the thirty HSPF simulations.

H5.1 GENERAL STRATEGY

The steps in calculating the long-term average concentrations of contaminants in stream flow and in stream sediments along the Walnut Creek drainage were:

- Generation of thirty 30-year meteorological time series, including precipitation, solar radiation, wind speed, air temperature and dew-point temperature
- Generation of thirty 30-year time series for other HSPF inputs such as WWTP effluent
- Incorporation of pond operation rules to the model
- HSPF simulation of OU6 with calibrated flow, sediment and contaminant parameters
- Calculation of 95% Upper Confidence Limits on the mean of the 30 simulated long-term average contaminant concentrations

H5.2 METEOROLOGICAL DATA GENERATION

Prediction of long-term average concentrations of contaminants in surface water and stream sediment along the Walnut Creek drainage requires the preparation of HSPF input parameters. This preparation includes prediction of future meteorological data, which, for this modeling effort, were made with the CLIGEN weather generator. This section discusses the principles behind CLIGEN, and how it was applied to RFETS. The calculation of lake evaporation and potential evapotranspiration is also discussed.

H5.2.1 The CLIGEN Weather Generator

The CLIGEN program was developed for the Water Erosion Prediction Project (WEPP) (Lane and Nearing, 1989) and is based on the generators used in the EPIC and Simulator for Water Resources in Rural Basins (SWRRB) (Williams, et al., 1984; Williams et al., 1985). The selection of the CLIGEN program was based on the following:

- The generator has been well tested in many locations across the United States (Nicks, 1985).
- The inputs for the model have been developed for nearly 200 stations including 20 in Colorado.
- Parameter estimation software and techniques are available.

The CLIGEN program generates mean daily precipitation, daily maximum and minimum temperature, mean daily solar radiation, mean daily dew-point temperature, and mean daily wind direction and speed.

The number and distribution of precipitation events is generated using a two-state Markov chain model (Lane and Nearing 1989). The CLIGEN weather generator also generates the rainfall peak intensity and the time to peak intensity. Using these data and assuming a double-exponential function for storm intensity versus time, the rainfall patterns (hyetograph) of each storm event were determined.

Daily maximum and minimum temperatures, dew-point temperature and solar radiation are generated from normal distributions of daily values during a month. Wind speed is generated from a two-parameter gamma distribution based on mean monthly observed speed. Wind direction is generated by sampling the cumulative distribution of wind direction constructed from the observed percent time during a month with wind blowing from the 16 cardinal directions. The equations used to generate these weather data are given in Lane and Nearing (1989).

H5.2.2 Meteorological Data Generation

The 20 stations in the CLIGEN database that are in Colorado do not include RFETS or Stapleton International Airport. The closest station in this database to RFETS is the Fort Collins station. The database for the Fort Collins station was used to generate the meteorological data for the OU6 surface water flow and transport modeling study for the following reasons:

- Fort Collins and RFETS are at similar altitudes.
- Fort Collins and RFETS have similar proximities to the foothills of the Colorado Front Range.
- Yearly precipitation and rainfall patterns at Fort Collins and RFETS are similar according to Dr. Neil Doeskin of the Colorado Climate Center (personal communication).
- The length of record for the Fort Collins station is relatively long, 96 years.

Using the database for the Fort Collins station and the CLIGEN program provided by the USDA (Agricultural Research Service, W. Lafayette, Indiana), 30 meteorological time series were generated. Each time series contains 30 years of daily values of total precipitation, precipitation duration, time to peak, peak intensity, maximum and minimum air temperature, mean dew-point temperature, solar radiation, mean wind speed, and wind direction.

H5.2.3 Transformation of Daily Data to Hourly Data

The daily meteorological data generated by CLIGEN were transformed into hourly data required by HSPF. These transformations are accomplished by the following techniques.

<u>Precipitation</u>

Daily precipitation was disaggregated into hourly precipitation by applying a double-exponential function for precipitation intensity, i(t), proposed in the WEPP model. The double-exponential function is illustrated in Figure H5-1 and includes the following equations:

$$i(t) = \begin{cases} i_p e^{b(t-t_p)} & 1 \le t \le t_p \\ i_p e^{d(t_p-t)} & i_p < t \le 1.0 \end{cases} \qquad (5\text{-}1)$$

where i_p = normalized peak intensity
= peak intensity (inches/hr) / average intensity (inches/hr);
t_p = normalized time to peak intensity
= time to peak intensity (hr) / duration of storm;
b, d = empirical coefficients

Parameters b and d can be determined by solving the following two equations:

$$1.0 - e^{-bt_p} = \frac{bt_p}{i_p} \qquad (5\text{-}2)$$

and

$$1.0 - e^{-d(1-t_p)} = \frac{d(1-t_p)}{i_p} \qquad (5\text{-}3)$$

Then the normalized rainfall, ΔI, between normalized t_1 and t_2 is determined by:

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$$
\Delta I = \begin{cases} \displaystyle\int_{t_1}^{t_2} i_p e^{b(t-t_p)}\,dt & For \quad t_1,\ t_2 \le t_p \\ \displaystyle\int_{t_p}^{t_2} i_p e^{d(t_p-t)}\,dt - \int_{t_1}^{t_p} i_p e^{b(t-t_p)}\,dt & For\ t_1 \le t_p,\ t_2 > t_p \\ \displaystyle\int_{t_1}^{t_2} i_p e^{d(t_p-t)}\,dt & For\ t_1,\ t_2 > t_p \end{cases} \qquad (5\text{-}4)
$$

Temperature

Daily maximum and minimum temperatures were transformed into hourly temperatures by linear interpolations, assuming that minimum temperatures occur at 2:00 AM and maximum temperatures occur at 2:00 PM.

Solar Radiation

Daily solar radiation was divided into hourly solar radiation by the following step functions:

- 1/8 of the daily solar radiation for hours 11, 12, 13, and 14;
- 1/16 of the daily solar radiation for hours 8, 9, 10, 15, 16, and 17;
- 1/112 of the daily solar radiation for hours 1-7 and 18-24.

Dew-Point Temperature

Dew-point temperature was assumed to be a linear function of hourly air temperature;

$$
\textit{Hourly dew-point temperature} = C_{dpt} \cdot (\textit{Hourly air temperature}) \qquad (5\text{-}5)
$$

where

$$C_{dpt} = \frac{\textit{Daily mean dew-point temperature}}{\textit{Daily mean air temperature}} \qquad (5\text{-}6)$$

Wind Speed

Daily wind speed values were assumed to remain constant throughout the day.

H5.2.4 Determination of Lake Evaporation and Potential Evapotranspiration

Based on the hourly meteorological data, hourly lake evaporation and potential evapotranspiration were calculated by the following methods:

- Lake Evaporation - calculated by a method introduced by Lamoreux (1962) which is based on Penman's equation and calibrated to the Rocky Flats region in an unpublished EG&G study of the Great Western Reservoir;

- Potential Evapotranspiration - calculated by the modified Penman FAO-24 equation introduced in "Crop Water Requirements" by Doorenbos and Pruitt (1975).

H5.3 OTHER INPUTS TO THE PREDICTION SIMULATIONS

Effluent from the WWTP and drainage from building footer drains were included in the simulations. These external flows to the OU6 drainage system during each of the 30-year simulations were based on the data collected from January 1992 through July 1994. The data from these years were repeated as many times as necessary to provide a 30-year time series that was input to HSPF.

The external module PONDSIM, which was used to simulate the pond operation rules (Section H3.3) was used along with the HSPF model to complete the thirty 30-year simulations.

H5.4 SIMULATION RESULTS

Results of the thirty 30-year simulations were presented in terms of daily concentrations of Am-241, Pu-239/240, and antimony in the water columns and in the sediments of stream and ponds. Based on these results, the long-term (30 years) average concentrations of contaminants were determined.

H5.4.1 Calculation of 30-year Average Concentrations

Average Concentration in Deposited Stream/Pond Sediment

The average concentration of a contaminant in the newly deposited sediment was defined as the ratio of the total deposited mass of contaminant over the total deposited mass of sediment over the 30-year simulation. If sediment deposition did not occur in a given stream or pond, the average concentration of a contaminant was not applicable. The predicted 30-year average concentrations of contaminants in newly deposited stream/pond sediment are summarized in Tables H5-1 through H5-9.

Average Concentration in Stream/Pond Water

There are two ways to define the average concentration of a contaminant in stream/pond water over a certain time interval:

(1) The statistical mean of event (daily) average concentrations within the time interval,

(2) The ratio of the total mass of contaminants in the water over the total volume of water within the 30 year time interval.

In this study, the second technique was used to define the average concentration of a contaminant in stream/pond water because it can overcome the problem of the HSPF model which predicts extremely high concentrations when the volume of water in the ponds approaches zero.

Water volumes of Ponds A-1, B-1, and B-2 all drop below 10% of their capacities during the 30-year simulations because the 10% minimum capacity rule was not incorporated in the OU6 model. As discussed in Section H3.3, the simulated contaminant concentrations in pond water under such conditions were probably over-estimated. In such cases the model predictions were neglected, the water volumes of these four ponds (A-1, A-2, B-1, and B-2) were assumed to be at 10% of their capacities and the concentrations were adjusted to be the ratio of total simulated mass to the adjusted pond water volume (i.e., 10% of pond capacity). The total simulated mass equals the initial simulated contaminant concentrations times the simulated volume (below 10% of pond capacity).

The predicted average concentrations of contaminants for each 30-year simulation in stream/pond water at the selected locations are given in Tables H5-1 to H5-9.

H5.4.2 Calculation of One-Sided 95% UCL of Average Concentrations

The simulated thirty 30-year average concentrations of each contaminant in stream/pond water and sediment were then used to calculate the long-term average concentrations of that contaminant, defined as the one-sided 95% Upper Confidence Limit on the mean of those 30 averaged concentrations,

$$C_{UCL} = \bar{c} + t_{(n-1,\ 0.10)} \cdot \frac{S_c}{\sqrt{n-1}} \tag{5-7}$$

where

	C_{UCL}	=	95% Upper Confidence Limit of the mean,
	$\bar{c}$	=	mean of 30 average concentrations,
	$t_{(n-1,\ 0.10)}$	=	Student t with (n-1) degrees of freedom and a significance level of 0.10,
	S_c	=	standard deviation of 30 average concentrations,
	n	=	number of samples = 30.

The calculated one-sided 95% UCLs for each chemical in stream/pond water and sediment are given at the bottom of Tables H5-1 to H5-9 and summarized in Table H5-10.

H5.4.3 Average Concentrations for Risk Assessment

The average concentration of a contaminant in stream/pond sediment was determined by the initial concentration in stream/pond sediment and the concentration in the new deposited sediment:

1. *For those reaches and reservoirs for which sediment deposition was not* predicted to occur over the 30-year simulation, no deposition of contaminants took place. For these cases, the average concentration of a contaminant in the stream/pond sediment was assumed to equal the initial concentration in the stream/pond sediment.

2. For those reaches and reservoirs for which sediment deposition was predicted to occur over the 30-year simulation, the average concentration of a contaminant in the stream/pond sediment is the depth-weighted average concentration of the initial concentration and the simulated average concentration in the new deposit. The procedure for calculating this depth-weighted average is described below.

To support risk assessment, the modeling objective was to estimate contaminant concentrations in the top 2 feet of sediment after 15 years of sedimentation. The value of 2 feet corresponds to the 0 to 2 foot interval that was sampled in the OU6 Phase I investigation of pond sediment. Although the OU6 model simulated 30 years of new deposition, exposure concentrations for RA are the average concentrations during the 30-year period, and it was assumed that loading of contaminants into the ponds was constant for the 30-year simulations, and thus the average concentrations occurred at 15 years. Therefore, each sediment concentration used for risk assessment is a depth-weighted average of the initial sediment concentration ($C_{initial}$) and the new sediment concentration ($C_{deposit}$) following 15 years of deposition. If 4 feet or more of new sediment is deposited in 30 years (i.e., 2 feet or more will have been deposited in 15 years), the exposure concentration equals $C_{deposit}$. Therefore, the average concentration of a contaminant in the top 2 feet of pond sediments was determined by the following equation,

$$C = \begin{cases} \dfrac{1}{2.0}\left[(2.0 - H/2)\,C_{initial} + \dfrac{1}{2}H\,C_{deposit}\right], & \text{if } H < 4.0 \text{ feet} \\ C_{deposit}\,, & \text{if } H \geq 4.0 \text{ feet} \end{cases} \quad \textbf{(5-8)}$$

where C = the average concentration for risk assessment,

$C_{initial}$ = average concentration in initial sediment deposit,

$C_{deposit}$ = average concentration in new sediment deposit, $C_{deposit} = C_{UCL}$ (based on the 30-year simulations),

H = depth of new sediment deposit during the 30-year simulation.

If the predicted depth of newly deposited sediment in a reach/pond for 30 years is greater than 4.0 feet, the average concentration for risk assessment is the average concentration in the new deposit. The results are summarized in Table H5-11.

The average concentrations for risk assessment of contaminants in stream/pond water were taken as the calculated 95% UCLs of the mean concentrations as estimated from equation (5-8). The results are presented in Table H5-11.

SUMMARY, CONCLUSIONS AND LIMITATIONS

H6.1 SUMMARY AND CONCLUSIONS

A mathematical computer model, HSPF, was used to simulate the movement of water, sediment, and selected contaminants from pervious and impervious land areas to creeks, ditches, and ponds within the OU6 Walnut Creek drainage system. The main objective of the modeling study was to predict long-term average concentrations of contaminants in the water column and sediment of ponds and streams in support of human health and ecological risk assessment. The modeled chemicals include sediment-associated Americium-241, Plutonium-239/240, and antimony.

Several pervious land parameters and one impervious land parameter in the OU6 HSPF model were calibrated to measured flow data and pond volume data for 1993 at selected gaging stations and ponds along Walnut Creek. Data prior to 1993 were not considered accurate enough for calibration. The results were discussed in Section H4.1 of this appendix and showed good agreement between the measured and the predicted flow data and pond volumes.

For sediment transport parameters, the OU6 HSPF model was calibrated to estimated sedimentation rates in the A- and B- series detention ponds during a seven-year time interval (1986 - 1992). The predicted sediments deposited in the targeted individual ponds were within 37% of the estimated sedimentation. The prediction errors were much smaller (7% or less) for the total sediment deposited in the "pooled" ponds.

Also for sediment transport parameters, simulated TSS concentrations were compared with measured 1993 TSS concentration at a couple of sampling stations along Walnut Creek. Although the comparison indicates a considerable prediction error, the simulated TSS concentrations are mostly within the same order of magnitude as the measured TSS concentrations. Because the measured TSS concentrations are results from instantaneous grab samples and the predicted TSS concentrations represent mean daily values, the prediction errors are expected and are considered acceptable.

Simulated contaminant concentrations in surface water along Walnut Creek during the seven-year sediment calibration time interval (April 1986 - March 1993) were roughly compared with the measured values. However, the comparison was only qualitative and the water quality calibration parameters were not adjusted based on this comparison because of the inadequate historical concentration data available. The water quality calibration parameters were assumed to depend on the calibration of the sediment transport model.

The calibrated OU6 HSPF model was applied to estimate the fate and transport of the selected COCs within the OU6 drainage system. Thirty 30-year simulations were conducted to generate the necessary information for calculating the long-term average concentrations of contaminants in the water and sediments within the creeks and ponds. The results were used in the risk assessment analysis, which is presented in Appendix J and summarized in Section 6.0 of this RFI/RI report.

The simulation indicated that no net erosion occurs at any of the detention ponds. This confirms the results of Woodward-Clyde's preliminary evaluation of the migration of existing pond sediment (Attachment A): there is little likelihood for pond contaminated sediments to migrate out of the system to Indiana Street.

H6.2 MODEL LIMITATIONS

The estimated long-term average concentrations of contaminants of concern in the water and sediments of the creeks and ponds along Walnut Creek were based on available data for the site and a simplified conceptual and mathematical flow and transport model (HSPF) applied to the study area. To the extent that available data and simplifying assumptions used in the model differ from actual site conditions, the model results may not be representative of actual future contaminant concentrations at receptor locations. However, the model results are reasonable and believed to be adequate for supporting the human health and ecological risk assessment.

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TABLE H1-1

1993 SAMPLE RESULTS FOR TOTAL AM-241, TOTAL PU-239/240, AND TSS

Am-241

	BASEFLOW			STORM RUNOFF		
	LOCATION	RESULT(pCi/L)	DATE SAMPLED	LOCATION	RESULT(pCi/L)	DATE SAMPLED
	SW67093	0.001	04/05/93	SW68593	0.030	5/17/93
	SW67193	0.004	04/05/93	SW68693	0.036	5/17/93
	SW67393	0.000	04/05/93	SW68793	0.000	5/17/93
	SW67493	0.001	04/05/93	SW68893*	0.140	5/17/93
	SW67593*	0.003	04/06/93	SW68993	0.036	5/17/93
	SW67693	0.004	04/06/93	SW69093*	2.800	5/17/93
	SW67893	0.008	04/06/93	SW69293	0.034	5/17/93
	SW67993	0.003	04/06/93	SW69393	0.086	5/17/93
	SW68093	0.007	04/07/93			
	SW68193*	0.002	04/06/93			
	SW68293	0.003	04/06/93			

Pu-239/240

	LOCATION	RESULT(pCi/L)	DATE SAMPLED	LOCATION	RESULT(pCi/L)	DATE SAMPLED
	SW67093	0.003	04/05/93	SW68593	0.150	5/17/93
	SW67193	-0.002	04/05/93	SW68693	0.120	5/17/93
	SW67393	0.003	04/05/93	SW68793	0.010	5/17/93
	SW67493	-0.002	04/05/93	SW68893*	0.190	5/17/93
	SW67593*	0.003	04/06/93	SW68993	0.170	5/17/93
	SW67693	-0.001	04/06/93	SW69093*	10.850	5/17/93
	SW67893	0.003	04/06/93	SW69293	0.072	5/17/93
	SW67993	0.000	04/06/93	SW69393	0.140	5/17/93
	SW68093	0.001	04/07/93			
	SW68193*	0.001	04/06/93			
	SW68293	0.002	04/06/93			

TSS

	LOCATION	RESULT(mg/L)	DATE SAMPLED	LOCATION	RESULT(mg/L)	DATE SAMPLED
	SW061*	17	4/7/93	SW68593	1900.00	5/17/93
	SW061*	4	4/22/93	SW68693	55.00	5/17/93
	SW061*	9	5/5/93	SW68793	250.00	5/17/93
	SW061*	5	5/19/93	SW68893*	390.00	5/17/93
	SW061*	5	6/2/93	SW68993	60.00	5/17/93
	SW061*	5	6/16/93	SW69093*	21500.00	5/17/93
	SW061*	8	6/30/93	SW69293	140.00	5/17/93
	SW061*	5	7/14/93	SW69393	190.00	5/17/93
	SW061*	5	7/28/93			
	SW061*	5	8/11/93			
	SW061*	4	8/27/93			

* sample locations receiving runoff from largely impervious areas

TABLE H3-1
AREA-WEIGHTED AVERAGE CHEMICAL CONCENTRATIONS IN SURFICIAL SOILS

Segment Number*	Pu-239/240 concentration		Am-241 concentration		Antimony concentration	
	(pci/gm)	(pci/ton)	(pci/gm)	(pci/ton)	(mg/kg)	(gm/ton)
I1	0.000	0	0.000	0	0.0000	0.000
P1	0.002	1,816	0.001	908	0.1928	0.175
P2	0.000	0	0.000	0	0.0000	0.000
P3	0.000	0	0.000	0	0.0014	0.001
P4	0.000	0	0.000	0	0.0000	0.000
P5	0.000	0	0.000	0	0.0000	0.000
P6	0.000	0	0.000	0	0.0000	0.000
P7 and I2	0.000	0	0.000	0	0.0012	0.001
P8 and I3	0.576	523,008	0.298	270,584	3.9651	3.600
P9	0.140	127,120	0.061	55,388	1.5197	1.380
P10	0.340	308,720	0.088	79,904	1.6971	1.541
P11	0.115	104,420	0.055	49,940	1.1554	1.049
P12	0.251	227,908	0.042	38,136	1.9426	1.764
P13	0.023	20,884	0.010	9,080	0.6621	0.601
P14 and I4	0.008	7,264	0.004	3,632	0.1920	0.174
P15	0.111	100,788	0.092	83,536	3.2747	2.973
P16	0.149	135,292	0.000	0	2.3624	2.145
P17	0.010	9,080	0.000	0	0.0966	0.088
P18	0.094	85,352	0.000	0	0.0000	0.000
P19	0.181	164,348	0.012	10,896	4.0423	3.670
P20	0.326	296,008	0.004	3,632	1.5952	1.448
P21	0.000	0	0.000	0	0.0000	0.000

* Number represents segment number of Impervious or Pervious land-segment.

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TABLE H3-2
INITIAL CHEMICAL CONCENTRATIONS IN STREAM/POND SEDIMENTS

POND/REACH	Americium-241 (pci/g)	Plutonium-239/240 (pci/g)	Antimony (mg/kg)
A-1 (R-25)	9.31	29.04	20.52
A-2 (R-26)	1.011	3.187	12
A-3 (R-10)	0.413	1.214	13.5
A-4 (R-12)	0.0695	0.155	28.75
B-1 (R-21)	100.57	56.33	12
B-2 (R-22)	11.378	26.76	12
B-3 (R-14)	23.69	78.89	47.4
B-4 (R-16)	0.848	2.61	17.075
B-5 (R-18)	0.128	0.237	10.625
R-07	0.04	0.08	8.2
R-11	0.1855	1.035	0
R-15	0.2	1.6	0
R-17	0.063	0	0
R-23	0.121	0.21	0
R-27	0.44	1.37	0
All other reaches	0	0	0

SOURCE: Based on previous sediment sampling results as part of the Phase I investigation (Phase I RFI/RI Report, 1995)

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TABLE H4-1
WATER BUDGET FOR 1987 - 1992 BASED ON HSPF SIMULATION

Water Year	Precip. in	Precip. a-f *	WWTP Effluent a-f	Footer Drainage a-f	Impervious Runoff a-f	Walnut Flow at Indiana St. a-f	Total Evaporation a-f	Total ET a-f	ET/prec.	Infiltration to Groundwater from Creeks a-f
1987	16.78	2447	188	34	138	282	48	2197	0.90	82
1988	11.64	1698	174	34	98	266	39	1612	0.95	74
1989	13.84	2018	174	34	119	234	45	1739	0.86	70
1990	13.26	1934	174	34	120	266	39	1899	0.98	77
1991	15.43	2250	174	34	159	313	40	2112	0.94	91
1992	14.20	2071	174	34	144	287	40	1871	0.90	83
avg.	14.19	2070	176	34	130	275	42	1905	0.92	79

* Based on 1750 acres of total drainage area

TABLE H4-2
MEASURED TSS CONCENTRATIONS ALONG WALNUT CREEK DURING THE 1993 CALIBRATION TIME INTERVAL (*)

LOCATION	PHYSICAL LOCATION	ANALYTE	RESULT	REP-LIM	UNITS	QUAL-LAB	QUAL-WC	DATE SAMPLED
SW68593	Out of BNDY	TSS	1,900	4	MG/L		V	5/17/93
SW68693	R-23	TSS	55	4	MG/L		V	5/17/93
SW68793	R-8	TSS	250	4	MG/L		V	5/17/93
SW68893	P-15	TSS	390	4	MG/L		V	5/17/93
SW68993	R-19 or R-20	TSS	60	4	MG/L		V	5/17/93
SW69093	R-9	TSS	21,500	4	MG/L		V	5/17/93
SW69293	R-8	TSS	140	4	MG/L		V	5/17/93
SW69393	R-8	TSS	190	4	MG/L		V	5/17/93
SW061	R-19	TSS	17	5	MG/L		V	4/7/93
SW061	R-19	TSS	4	4	MG/L	U	V	4/22/93
SW061	R-19	TSS	9	5	MG/L		V	5/5/93
SW061	R-19	TSS	5	5	MG/L	U	V	5/19/93
SW061	R-19	TSS	5	5	MG/L		V	6/2/93
SW061	R-19	TSS	5	5	MG/L	U	V	6/16/93
SW061	R-19	TSS	8	5	MG/L		V	6/30/93
SW061	R-19	TSS	5	5	MG/L	U	V	7/14/93
SW061	R-19	TSS	5	5	MG/L	U	V	7/28/93
SW061	R-19	TSS	5	5	MG/L	U	V	8/11/93
SW061	R-19	TSS	4	4	MG/L	U	V	8/27/93

* From data obtained from EG&G Rocky Flats.

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TABLE H4-3
DEPTH OF SEDIMENT DEPOSITED IN DETENTION PONDS
(Based on 1992 Pond Sediment Sampling)

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Site ID	Location	Sample #	Core Depth (inch)	Site ID	Location	Sample #	Core Depth (inch)
POND A-1	SED60192	SD60001WC	16.3	POND B-1	SED62192	SD60021WC	11
	SED60292	SD60002WC	19.3		SED62292	SD60022WC	28
	SED60392	SD60003WC	20		SED62392	SD60023WC	18
	SED60492	SD60004WC	13.5		SED62492	SD60024WC	18
	Mean		**17.28**		**Mean**		**18.75**
POND A-2	SED60692	SD60006WC	8.5	POND B-2	SED62692	SD60026WC	8
	SED60792	SD60007WC	6		SED62792	SD60027WC	6
	SED60892	SD60008WC	6		SED62892	SD60028WC	14
	SED60992	SD60009WC	8		SED62992	SD60029WC	15
	Mean		**7.13**		**Mean**		**10.75**
POND A-3	SED61192	SD60011WC	14.4	POND B-3	SED63192	SD60031WC	16
	SED61292	SD60012WC	12.4		SED63292	SD60032WC	31
	SED61392	SD60013WC	14.1		SED63392	SD60033WC	25.5
	SED61492	SD60014WC	12		SED63492	SD60034WC	6.4
	Mean		**13.23**		**Mean**		**19.73**
POND A-4	SED61692	SD60016WC	2.8	POND B-4	SED63692	SD60036WC	15.9
	SED61792	SD60017WC	6.6		SED63792	SD60037WC	31.5
	SED61892	SD60018WC	2.8		SED63892	SD60038WC	30.9
	SED61992	SD60019WC	9.4		SED63992	SD60039WC	12.9
	Mean		**5.4**		**Mean**		**22.8**
				POND B-5	SED64192	SD60041WC	6
					SED64292	SD60042WC	8.4
					SED64392	SD60043WC	8.8
					SED64492	SD60044WC	2.5
					Mean		**6.43**

TABLE H4-4
POND SEDIMENTATION RATES CALCULATION

Pond #	Const. year	Total years of operation	Approx. surface area of deposit (ft^2)	Mean depth of deposit along centerline (ft)	Mean depth of deposit along centerline (cm/yr)	Total amount of deposit volume (ft^3)	Total amount of deposit weight (T/Yr)	Alpha	Total amount of deposit in 7-years (Tons)	Average deposit in 7-years weight (Tons/Yr)	Average deposit in 7-years volume (ft^3/Yr)
(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)	(9)	(10)	(11)
A-1	1954	39	32,000	1.45	1.13	23,200	22.43	0.157	137.32	19.62	520.34
A-2	1972	21	48,000	0.58	0.84	13,920	24.99	0.306	160.58	22.94	608.50
A-3	1974	19	67,500	1.26	2.01	42,525	84.38	0.321	514.62	73.52	1950.08
A-4	1980	13	28,500	0.46	1.07	6,555	19.01	0.508	125.54	17.93	475.71
B-1	1962	31	12,600	1.73	1.69	10,899	13.25	0.221	90.81	12.97	344.10
B-2	1953	40	34,000	1.05	0.79	17,850	16.82	0.153	102.96	14.71	390.15
B-3	1953	40	16,800	1.52	1.15	12,768	12.03	0.153	73.65	10.52	279.07
B-4	1953	40	18,000	2.00	1.51	18,000	16.97	0.153	103.83	14.83	393.43
B-5	1980	19	21,600	0.57	0.91	6,156	12.21	0.321	74.50	10.64	282.30

Assume:
a) Specific weight of wet sediment in the ponds = 75.4 lbs/ft^3
b) Deposit volume V= Coeff.(AD) (See text Coeff. = 0.5
c) Sedimentation Rate = (V/T)*Density /2000.
d) 7-Years deposit = Alpha * Total Deposit
e) Alpha = Coefficient in Equation 4-5 (See text for explanation).

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TABLE H4-5
RESULTS OF POND SEDIMENTATION RATES CALIBRATION

Pond	Prediction Error (%)	Estimated Sediment Deposited in 7 years based on field data (Tons)	HSPF Predicted Sedimentation Rate: Total in 7 years (Tons)	HSPF Predicted Sedimentation Rate: Yearly Average (Tons/Yr)	HSPF Predicted Sedimentation Rate: Daily Maximum (Tons/day)
A-1	-99.9	137.32	0.0692	0.0099	0.068
A-2	-99.8	160.59	0.322	0.046	0.306
A-3	66.5	514.62	857	122.4	73
A-4	-16.4	125.54	105	15	5.54
B-1	-100.0	90.81	0.0288	0.00411	0.0272
B-2	-99.9	102.95	0.0822	0.0117	0.0816
B-3	-100.0	73.64	0.0252	0.0036	0.0238
B-4	282.4	103.82	397	56.71	42.4
B-5	-37.2	74.5	46.8	6.69	10.4
Total of A-1 to A-3	5.5	812.53	857.39		
Total of A-1 to A-4	2.6	938.07	962.39		
Total of B-1 to B-4	7.0	371.22	397.14		
Total of B-1 to B-5	-0.4	445.72	443.94		

Note:
1) Prediction Error = (100%) (Predicted - Estimated)/(Estimated)
2) Target for calibration is the total in each branch of the Walnut Creek.
3) Highlighted individual or "pooled" ponds are targeted for calibration, see text for detail.

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TABLE H4-6
COMPARISON OF MEASURED AND PREDICTED TSS CONCENTRATIONS ALONG WALNUT CREEK DURING THE 1993 CALIBRATION TIME INTERVAL

Location	Approx. Physical Location	Dates Sampled	Measured TSS conc. (mg/L) Result	Qual-Lab	RFP-Limit*	Predicted TSS conc. (mg/L)	Prediction Error (%)
SW68593	Out of BNDY	5/17/93	1900		4	NA	
SW68693	R-23	5/17/93	55		4	0.90	-98.4
SW68793	R-8	5/17/93	250		4	302.2	20.9
SW68893	NA	5/17/93	390		4	NA	
SW68993	R-19 or R-20	5/17/93	60		4	210.9	251.5
SW69093	R-9	5/17/93	21500		4	385.8	-98.2
SW69293	R-8	5/17/93	140		4	302.2	115.9
SW69393	R-8	5/17/93	190		4	302.2	59.1
SW061	R-19	4/7/93	17		5	13.64	-19.8
SW061	R-19	4/22/93	4	U	4	0.054	0.0
SW061	R-19	5/5/93	9		5	0.036	-99.6
SW061	R-19	5/19/93	5	U	5	26.107	422.1
SW061	R-19	6/2/93	5		5	0.0089	-99.8
SW061	R-19	6/16/93	5	U	5	0.00063	0.0
SW061	R-19	6/30/93	8		5	0.029	-99.6
SW061	R-19	7/14/93	5	U	5	112.6	2152.0
SW061	R-19	7/28/93	5	U	5	0.012	0.0
SW061	R-19	8/11/93	5	U	5	0.00074	0.0
SW061	R-19	8/27/93	4	U	4	0.00011	0.0

* "RFP-Limit" - Detection Limit set for Rocky Flats Environmental Test Site.

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TABLE H4-7
VALUES OF SOME OF THE CALIBRATED SEDIMENT PARAMETERS

Parameter	Meaning	Value	Unit
	PERLND Segment		
KRER	Soil detachment coefficient	0.5	Complex*
JRER	Soil detachment exponent	1.7	Complex*
KSER	Soil washoff coefficient	0.08	Complex*
JSER	Soil washoff exponent	1.5	Complex*
KGER	Soil scour coefficient	1.2	Complex*
JGER	Soil scour exponent	1.8	Complex*
	IMPLND SEGMENT		
KEIM	Soil washoff coefficient	0.80 - 1.50	Complex*
JEIM	Soil washoff exponent	1.7	Complex*
ACCSDP	Atmospheric deposition rate	0.02	tons/ac.day
	RCHRES SEGMENT		
DB50	Bed material (sand) grain size	0.045 - 0.500	Inches
TAUCD	Critical shear stress for deposition of silt and clay	0.04 - 0.05	lb/ft^2
TAUCS	Critical shear stress for scour of silt and clay	0.05 - 0.075	lb/ft^2
M	Scour coefficient for silt and clay	0.05	lb/ft^2.day

* Unit of this parameter depends on the value used for another parameter in the same equation. For example, the unit for KRER depends on the value of JRER.

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TABLE H4-8
SUMMARY OF MEASURED CHEMICAL CONCENTRATIONS (*)

Sampling Location Code	Results of Am-241 Measurements					Results of Pu-239/240 Measurements				
	Time Interval	Number of measurements	Maximum (PCI/L)	Minimum (PCI/L)	Mean (PCI/L)	Time Interval	Number of measurements	Maximum (PCI/L)	Minimum (PCI/L)	Mean (PCI/L)
SW003	8/20/86 - 2/6/92	47	0.0486	-0.0029	0.0062	8/20/86 - 2/6/92	44	0.035	-0.04	0.00661
SW016	6/26/89 - 9/24/90	11	1.204	0	0.1143	6/26/89 - 9/24/90	14	0.019	0	0.00660
SW017	8/12/86 - 2/26/92	16	0.855	0	0.0584	8/12/86 - 2/26/92	16	1	-0.00119	0.0850
SW092	3/23/89 - 2/6/92	32	0.047	-0.001	0.0088	7/7/88 - 2/6/92	36	0.602	-0.000446	0.0322
SW113	8/25/89 - 10/18/89	2	0.006	0	0.003	8/25/89 - 10/18/89	2	0.009	0	0.0045
SW118	10/29/90 - 3/12/92	12	2.7	0.00147	0.3329	10/29/90 - 3/12/92	12	0.3	-0.002	0.0313
SWA1	8/14/86 - 8/24/89	7	0.02	0	0.01	8/14/86 - 8/24/89	7	0.24	0.01	0.0514
SWA2	8/14/86 - 8/23/89	8	0.05	0	0.01	8/14/86 - 8/23/89	8	0.17	0.02	0.0413
SWA3	8/14/86 - 8/23/89	12	0.02	0	0.0058	8/14/86 - 8/23/89	12	0.03	0	0.0125
SWA4	8/14/86 - 5/1/90	16	0.102	-0.0030	0.0117	8/14/86 - 5/1/90	16	0.02	0	0.00475
SW023	8/19/86 - 4/23/92	24	4	-0.03	0.2838	8/19/86 - 4/23/92	24	1	0	0.09359
SW024	8/19/86	1	0.01	0.01	0.01	8/19/86	1	-0.02	-0.02	-0.02
SW061	7/22/87 - 4/7/94	108	1.326	-0.005	0.0419	7/22/87 - 4/7/94	93	2	-0.002	0.0407
SWB1	8/16/86 - 8/22/89	9	0.08	-0.01	0.04	8/16/86 - 8/22/89	9	4.2	0.03	0.6278
SWB2	8/15/86 - 8/17/89	12	0.23	0	0.0533	8/15/86 - 8/17/89	12	0.5	0.02	0.1283
SWB3	8/15/86 - 8/16/89	8	0.05	-0.01	0.02875	8/15/86 - 8/16/89	8	0.15	0.04	0.085
SWB4	8/15/86 - 8/15/89	8	0.02	-0.02	0.00875	8/15/86 - 8/15/89	7	0.01	0	0.0071
SWB5	8/18/86 - 3/23/90	28	0.034	-0.02	0.00132	8/18/86 - 3/23/90	27	0.016	0.000	0.00215

- All data come from EG&G Rocky Flats and were compiled here particularly for this study.

TABLE H4-9
SUMMARY OF AMERICIUM AND PLUTONIUM CONCENTRATIONS FROM THE SEVEN-YEAR SIMULATION (APRIL 1986 - MARCH 1993)

REACH 8

	Am-241	Pu-239/240
Average concentration for 7-year period (pCi/l)	0.00	0.00

Range (pCi/L)	Number of hourly concentrations within each range during the seven year simulation: Am-241	Pu-239/240
0.0E+00 - 1.0E-08	61368	61368
1.0E-08 - 1.0E-07	0	0
1.0E-07 - 1.0E-06	0	0
1.0E-06 - 1.0E-05	0	0
1.0E-05 - 1.0E-04	0	0
1.0E-04 - 1.0E-03	0	0
1.0E-03 - 1.0E-02	0	0
1.0E-02 - 1.0E-01	0	0
1.0E-01 - 1.0E+00	0	0
1.0E+00 - 1.0E+01	0	0
1.0E+01 - 1.0E+02	0	0
1.0E+02 - 1.0E+03	0	0
1.0E+03 - 1.0E+04	0	0

REACH 9

	Am-241	Pu-239/240
Average concentration for 7-year period (pCi/l)	0.0827	0.1598

Range (pCi/L)	Number of hourly concentrations within each range during the seven year simulation: Am-241	Pu-239/240
0.0E+00 - 1.0E-08	42184	42182
1.0E-08 - 1.0E-07	7	5
1.0E-07 - 1.0E-06	8	7
1.0E-06 - 1.0E-05	16	15
1.0E-05 - 1.0E-04	832	352
1.0E-04 - 1.0E-03	7771	5232
1.0E-03 - 1.0E-02	6000	7726
1.0E-02 - 1.0E-01	3097	3732
1.0E-01 - 1.0E+00	1293	1744
1.0E+00 - 1.0E+01	148	345
1.0E+01 - 1.0E+02	10	26
1.0E+02 - 1.0E+03	0	0
1.0E+03 - 1.0E+04	2	2

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TABLE H4-9
SUMMARY OF AMERICIUM AND PLUTONIUM CONCENTRATIONS FROM THE SEVEN-YEAR SIMULATION (APRIL 1986 - MARCH 1993)

REACH 19

	Am-241	Pu-239/240
Average concentration for 7-year period (pCi/l)	0.000122	0.000245

Range (pCi/L)	Number of hourly concentrations within each range during the seven year simulation: Am-241	Pu-239/240
0.0E+00 - 1.0E-08	17466	14578
1.0E-08 - 1.0E-07	11532	10780
1.0E-07 - 1.0E-06	10653	11191
1.0E-06 - 1.0E-05	8510	9348
1.0E-05 - 1.0E-04	6216	6776
1.0E-04 - 1.0E-03	4975	5240
1.0E-03 - 1.0E-02	1989	3256
1.0E-02 - 1.0E-01	27	199
1.0E-01 - 1.0E+00	0	0
1.0E+00 - 1.0E+01	0	0
1.0E+01 - 1.0E+02	0	0
1.0E+02 - 1.0E+03	0	0
1.0E+03 - 1.0E+04	0	0

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TABLE H4-10
COMPARISON OF MEASURED AND PREDICTED CHEMICAL CONCENTRATIONS IN POND WATER

Pond ID	AM Concentrations		PU Concentrations		SB Concentrations	
	Measured Range (PCI/L)	Predicted Range (PCI/L)	Measured Range (PCI/L)	Predicted Range (PCI/L)	Measured Range (mg/L)	Predicted Range (mg/L)
SWA1	0 - 0.02	0 - 30.85	0.01 - 0.24	0 - 64.1	NA	0 - 0.00262
SWA2	0 - 0.05	4.46E-03 - 0.144	0.02 - 0.17	0.0146 - 0.453	NA	0 - 1.87E-10
SWA3	0 - 0.02	0 - 0.00951	0 - 0.03	0 - 0.0275	NA	0 - 2.05E-05
SWA4	0 - 0.102	0 - 0.00038	0 - 0.02	0 - 8.69E-04	NA	0 - 8.36E-07
SWB1	0 - 0.08	0.311 - 1210.0	0.03 - 4.2	0.0696 - 271.0	NA	0 - 2.01E-05
SWB2	0 - 0.23	0.00532 - 264.2	0.02 - 0.5	0.125 - 620.0	NA	0 - 5.34E-15
SWB3	0 - 0.05	0 - 0.0944	0.04 - 0.15	0 - 0.089	NA	0 - 1.14E-06
SWB4	0 - 0.02	0 - 0.341	0 - 0.01	0 - 1.14	NA	0 - 1.60E-05
SWB5	0 - 0.034	9.94E-06 - 0.0098	0 - 0.016	0 - 0.00239	NA	0 - 5.03E-06

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TABLE H5-1
SUMMARY STATISTICS OF SIMULATION RESULTS FOR POND-A1

Simulation	Total Deposited Sediment		Total outflow volume from the reach	Average concentration in deposited sediment			Average concentration in water		
	tons	ft^3	ft^3	Am 241 pci/g	Pu 239/240 pci/g	Sb mg/kg	Am 241 pci/l	Pu 239/240 pci/l	Sb mg/l
SIM-01	27.17	7.20E+02	0.00E+00	0.036	0.26	4.20	9.30E-03	2.90E-02	1.00E-08
SIM-02	36.75	9.70E+02	3.40E+05	0.029	0.24	4.10	7.30E-03	2.30E-02	3.70E-08
SIM-03	24.53	6.50E+02	0.00E+00	0.038	0.27	4.20	9.20E-03	2.90E-02	1.20E-08
SIM-04	2.59	6.90E+01	0.00E+00	0.26	0.95	4.10	1.90E-02	6.00E-02	8.50E-09
SIM-05	4.27	1.10E+02	0.00E+00	0.16	0.65	4.20	1.60E-02	5.10E-02	2.10E-08
SIM-06	23.09	6.10E+02	0.00E+00	0.040	0.27	4.20	1.80E-02	5.60E-02	6.30E-09
SIM-07	15.92	4.20E+02	0.00E+00	0.052	0.31	4.20	7.90E-03	2.50E-02	7.60E-09
SIM-08	35.62	9.40E+02	2.90E+04	0.030	0.24	4.20	1.00E-02	3.20E-02	8.50E-09
SIM-09	12.45	3.30E+02	0.00E+00	0.063	0.35	4.20	1.00E-02	3.10E-02	4.50E-08
SIM-10	4.64	1.20E+02	0.00E+00	0.15	0.61	4.20	1.30E-02	4.00E-02	1.60E-08
SIM-11	3.03	8.00E+01	0.00E+00	0.22	0.84	4.10	1.20E-02	3.70E-02	2.10E-08
SIM-12	18.24	4.80E+02	0.00E+00	0.047	0.30	4.20	9.80E-03	3.00E-02	1.60E-08
SIM-13	39.78	1.10E+03	9.90E+04	0.027	0.22	3.80	9.00E-03	2.80E-02	2.50E-07
SIM-14	20.54	5.40E+02	2.30E+04	0.043	0.29	4.20	1.60E-02	5.00E-02	1.80E-08
SIM-15	7.94	2.10E+02	0.00E+00	0.092	0.44	4.20	2.30E-02	7.30E-02	1.30E-08
SIM-16	2.35	6.20E+01	0.00E+00	0.28	1.00	4.10	1.50E-02	4.60E-02	3.00E-08
SIM-17	7.8	2.10E+02	0.00E+00	0.093	0.44	4.20	1.10E-02	3.40E-02	3.40E-08
SIM-18	6.53	1.70E+02	0.00E+00	0.11	0.49	4.20	1.10E-02	3.40E-02	4.00E-08
SIM-19	18.83	5.00E+02	1.20E+04	0.046	0.29	4.20	8.40E-03	2.60E-02	9.90E-09
SIM-20	8.58	2.30E+02	7.90E+03	0.086	0.42	4.20	1.70E-02	5.20E-02	6.60E-08
SIM-21	47.17	1.30E+03	4.20E+04	0.026	0.23	4.20	1.10E-02	3.50E-02	1.10E-08
SIM-22	2.84	7.50E+01	0.00E+00	0.23	0.88	4.10	9.30E-03	2.90E-02	2.80E-08
SIM-23	4.26	1.10E+02	0.00E+00	0.16	0.65	4.20	1.20E-02	3.60E-02	4.20E-08
SIM-24	2.09	5.50E+01	0.00E+00	0.31	1.10	4.10	1.10E-02	3.30E-02	2.20E-08
SIM-25	5.18	1.40E+02	0.00E+00	0.13	0.57	4.20	1.70E-02	5.40E-02	2.10E-08
SIM-26	28.02	7.40E+02	1.10E+05	0.035	0.26	4.20	9.30E-03	2.90E-02	1.40E-08
SIM-27	4.87	1.30E+02	0.00E+00	0.14	0.59	4.20	1.90E-02	6.00E-02	1.40E-08
SIM-28	1.07	2.80E+01	0.00E+00	0.60	2.00	4.00	1.20E-02	3.90E-02	2.00E-08
SIM-29	8.85	2.30E+02	0.00E+00	0.084	0.41	4.20	9.80E-03	3.10E-02	3.10E-08
SIM-30	0.67	1.80E+01	0.00E+00	0.95	3.10	3.80	1.50E-02	4.50E-02	4.00E-08
Summary Statistics:									
Maximum	47.17	1300	340000	0.95	3.1	4.2	0.023	0.073	2.50E-07
Minimum	0.67	18	0.00	0.026	0.22	3.8	0.0073	0.023	6.3E-09
Mean	14.19	378.23	22096.67	0.152	0.622	4.15	0.013	0.039	3.04E-08
S.D.	13.16	355.90	65965.91	0.194	0.599	0.107	0.0040	1.26E-02	4.38E-08
Student t(0.10)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
95% UCL (one-sided)	18.34	490.40	42887.36	0.213	0.811	4.18	0.014	0.043	4.42E-08

TABLE H5-2
SUMMARY STATISTICS OF SIMULATION RESULTS FOR POND-A2

Simulation	Total Deposited Sediment		Total outflow volume from the reach	Average concentration in deposited sediment			Average concentration in water		
	tons	ft^3	ft^3	Am 241 pci/g	Pu 239/240 pci/g	Sb mg/kg	Am 241 pci/l	Pu 239/240 pci/l	Sb mg/l
SIM-01	63.14	1.70E+03	0.00E+00	1.10E-02	3.60E-01	1.60	1.40E-02	4.50E-02	4.30E-10
SIM-02	86.62	2.30E+03	4.40E+05	9.30E-03	3.50E-01	1.70	5.50E-03	1.70E-02	2.80E-08
SIM-03	57.72	1.50E+03	0.00E+00	1.20E-02	3.60E-01	1.60	1.40E-02	4.40E-02	2.50E-10
SIM-04	6.23	1.70E+02	0.00E+00	7.40E-02	5.40E-01	1.60	1.30E-02	4.10E-02	3.40E-10
SIM-05	10.19	2.70E+02	0.00E+00	4.70E-02	4.60E-01	1.60	1.40E-02	4.50E-02	2.90E-11
SIM-06	54.35	1.40E+03	0.00E+00	1.20E-02	3.60E-01	1.60	5.70E-03	1.80E-02	1.70E-08
SIM-07	37.53	1.00E+03	0.00E+00	1.60E-02	3.70E-01	1.60	1.30E-02	4.00E-02	2.50E-10
SIM-08	83.76	2.20E+03	0.00E+00	9.30E-03	3.50E-01	1.60	1.20E-02	3.70E-02	9.50E-10
SIM-09	29.35	7.80E+02	0.00E+00	1.90E-02	3.80E-01	1.60	1.50E-02	4.60E-02	2.30E-10
SIM-10	11.06	2.90E+02	0.00E+00	4.30E-02	4.50E-01	1.60	1.40E-02	4.30E-02	2.50E-10
SIM-11	7.28	1.90E+02	0.00E+00	6.40E-02	5.10E-01	1.60	1.40E-02	4.50E-02	5.40E-11
SIM-12	42.97	1.10E+03	0.00E+00	1.40E-02	3.70E-01	1.60	1.40E-02	4.50E-02	2.10E-10
SIM-13	94.23	2.50E+03	0.00E+00	9.20E-03	3.60E-01	1.80	1.10E-02	3.60E-02	8.00E-08
SIM-14	48.23	1.30E+03	0.00E+00	1.30E-02	3.60E-01	1.60	1.20E-02	3.80E-02	9.60E-09
SIM-15	18.8	5.00E+02	0.00E+00	2.70E-02	4.00E-01	1.60	1.20E-02	3.90E-02	2.70E-09
SIM-16	5.68	1.50E+02	0.00E+00	8.00E-02	5.60E-01	1.50	7.90E-03	2.50E-02	1.10E-10
SIM-17	18.46	4.90E+02	0.00E+00	2.80E-02	4.00E-01	1.60	1.50E-02	4.60E-02	1.00E-10
SIM-18	15.49	4.10E+02	0.00E+00	3.20E-02	4.20E-01	1.60	1.40E-02	4.40E-02	4.90E-10
SIM-19	44.13	1.20E+03	0.00E+00	1.40E-02	3.70E-01	1.60	1.30E-02	4.20E-02	1.00E-08
SIM-20	19.96	5.30E+02	0.00E+00	2.60E-02	4.00E-01	1.60	4.90E-03	1.60E-02	1.60E-09
SIM-21	111.01	2.90E+03	0.00E+00	8.10E-03	3.50E-01	1.70	1.20E-02	3.80E-02	4.40E-08
SIM-22	6.81	1.80E+02	0.00E+00	6.80E-02	5.20E-01	1.60	1.50E-02	4.60E-02	2.80E-10
SIM-23	10.15	2.70E+02	0.00E+00	4.70E-02	4.60E-01	1.60	1.40E-02	4.50E-02	1.70E-10
SIM-24	5.06	1.30E+02	0.00E+00	9.00E-02	5.90E-01	1.50	7.60E-03	2.40E-02	6.40E-11
SIM-25	12.31	3.30E+02	0.00E+00	3.90E-02	4.40E-01	1.60	1.40E-02	4.50E-02	1.40E-10
SIM-26	66	1.80E+03	0.00E+00	1.10E-02	3.60E-01	1.70	1.00E-02	3.20E-02	3.70E-09
SIM-27	11.59	3.10E+02	0.00E+00	4.10E-02	4.40E-01	1.60	1.30E-02	4.20E-02	2.40E-09
SIM-28	2.68	7.10E+01	0.00E+00	1.70E-01	8.10E-01	1.40	1.50E-02	4.70E-02	1.70E-13
SIM-29	20.93	5.60E+02	0.00E+00	2.50E-02	4.00E-01	1.60	1.40E-02	4.50E-02	7.40E-11
SIM-30	1.74	4.60E+01	0.00E+00	2.50E-01	1.10E+00	1.30	1.40E-02	4.40E-02	1.30E-10
Summary Statistics:									
Maximum	111.01	2900	440000	0.25	1.1000	1.80	0.015	0.047	8.00E-08
Minimum	1.74	46	0.00	0.0081	0.35	1.30	0.0049	0.0160	1.7E-13
Mean	33.45	885.90	14666.67	0.044	0.453	1.59	0.012	0.039	6.79E-09
S.D.	30.94	817.17	80332.64	0.052	0.157	0.087	0.0030	0.0093	1.69E-08
Student t(0.10)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
95% UCL (one-sided)	43.20	1143.45	39985.37	0.060	0.503	1.62	0.013	0.042	1.21E-08

TABLE H5-3
SUMMARY STATISTICS OF SIMULATION RESULTS FOR POND-A3

Simulation	Total Deposited Sediment		Total outflow volume from the reach	Average concentration in deposited sediment			Average concentration in water		
				Am 241	Pu 239/240	Sb	Am 241	Pu 239/240	Sb
	tons	ft^3	ft^3	pci/g	pci/g	mg/kg	pci/l	pci/l	mg/l
SIM-01	6025.62	1.60E+05	1.00E+08	2.40E-02	4.70E-02	0.33	1.90E-05	4.20E-05	1.90E-07
SIM-02	7449.48	2.00E+05	1.10E+08	2.20E-02	4.20E-02	0.30	2.00E-05	4.50E-05	2.00E-07
SIM-03	6674.19	1.80E+05	9.70E+07	2.20E-02	4.30E-02	0.30	2.10E-05	4.90E-05	1.80E-07
SIM-04	6533.34	1.70E+05	1.10E+08	2.30E-02	4.50E-02	0.31	2.00E-05	4.40E-05	1.90E-07
SIM-05	6722.21	1.80E+05	9.80E+07	2.30E-02	4.40E-02	0.31	2.10E-05	4.60E-05	1.90E-07
SIM-06	6003.81	1.60E+05	1.00E+08	2.20E-02	4.40E-02	0.31	1.80E-05	4.00E-05	1.80E-07
SIM-07	5981.32	1.60E+05	9.60E+07	2.30E-02	4.50E-02	0.31	2.20E-05	4.90E-05	2.20E-07
SIM-08	7187.13	1.90E+05	1.00E+08	2.30E-02	4.50E-02	0.31	2.10E-05	4.60E-05	2.10E-07
SIM-09	5542.7	1.50E+05	9.30E+07	2.30E-02	4.50E-02	0.32	1.90E-05	4.40E-05	1.50E-07
SIM-10	6319.44	1.70E+05	1.00E+08	2.40E-02	4.60E-02	0.32	1.90E-05	4.10E-05	1.80E-07
SIM-11	5519.84	1.50E+05	9.20E+07	2.40E-02	4.70E-02	0.32	1.90E-05	4.50E-05	1.60E-07
SIM-12	6593.77	1.70E+05	1.00E+08	2.40E-02	4.60E-02	0.32	2.00E-05	4.70E-05	1.70E-07
SIM-13	5999.03	1.60E+05	9.70E+07	2.30E-02	4.50E-02	0.31	1.90E-05	4.30E-05	1.80E-07
SIM-14	6755.85	1.80E+05	1.00E+08	2.30E-02	4.60E-02	0.32	2.20E-05	4.90E-05	2.30E-07
SIM-15	7286.38	1.90E+05	1.10E+08	2.20E-02	4.30E-02	0.30	1.90E-05	4.40E-05	1.80E-07
SIM-16	5740.28	1.50E+05	9.80E+07	2.40E-02	4.60E-02	0.32	1.90E-05	4.30E-05	1.70E-07
SIM-17	5772.6	1.50E+05	9.60E+07	2.40E-02	4.60E-02	0.32	2.00E-05	4.70E-05	1.80E-07
SIM-18	5329.68	1.40E+05	9.40E+07	2.40E-02	4.70E-02	0.32	2.20E-05	5.20E-05	1.80E-07
SIM-19	6153.77	1.60E+05	9.50E+07	2.30E-02	4.90E-02	0.31	1.90E-05	4.60E-05	1.80E-07
SIM-20	6441.82	1.70E+05	9.80E+07	2.30E-02	4.50E-02	0.31	1.80E-05	4.10E-05	1.70E-07
SIM-21	7354.52	2.00E+05	1.10E+08	2.30E-02	4.50E-02	0.32	2.40E-05	5.30E-05	2.60E-07
SIM-22	6378.8	1.70E+05	9.90E+07	2.40E-02	5.10E-02	0.32	2.20E-05	5.10E-05	2.10E-07
SIM-23	4820.78	1.30E+05	8.70E+07	2.40E-02	5.50E-02	0.32	1.90E-05	4.50E-05	1.50E-07
SIM-24	4702.69	1.20E+05	8.50E+07	2.40E-02	4.70E-02	0.33	1.70E-05	4.00E-05	1.40E-07
SIM-25	5915.46	1.60E+05	9.50E+07	2.30E-02	4.40E-02	0.30	2.20E-05	4.80E-05	2.20E-07
SIM-26	6665.59	1.80E+05	1.00E+08	2.20E-02	4.40E-02	0.30	2.10E-05	4.70E-05	2.20E-07
SIM-27	5258.64	1.40E+05	9.00E+07	2.30E-02	4.50E-02	0.31	1.80E-05	4.40E-05	1.40E-07
SIM-28	5147.73	1.40E+05	8.80E+07	2.40E-02	4.70E-02	0.32	1.80E-05	4.10E-05	1.50E-07
SIM-29	5792.82	1.50E+05	9.10E+07	2.40E-02	4.60E-02	0.32	2.10E-05	4.80E-05	1.80E-07
SIM-30	4763.07	1.30E+05	8.50E+07	2.40E-02	4.60E-02	0.32	1.70E-05	4.00E-05	1.30E-07
Summary Statistics:									
Maximum	7449.48	2.00E+05	1.10E+08	2.40E-02	5.50E-02	0.33	2.40E-05	5.30E-05	2.60E-07
Minimum	4702.69	1.20E+05	8.50E+07	2.20E-02	4.20E-02	0.30	1.70E-05	4.00E-05	1.30E-07
Mean	6094.41	1.62E+05	9.71E+07	2.33E-02	4.59E-02	0.31	1.99E-05	4.53E-05	1.83E-07
S.D.	760.29	2.04E+04	6.85E+06	7.40E-04	2.47E-03	8.58E-03	1.70E-06	3.58E-06	2.94E-08
Student t(0.10)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
95% UCL (one-sided)	6334.03	1.68E+05	9.93E+07	0.023	0.047	0.32	2.04E-05	4.65E-05	1.92E-07

TABLE H5-4
SUMMARY STATISTICS OF SIMULATION RESULTS FOR POND-A4

Simulation	Total Deposited Sediment		Total outflow volume from the reach	Average concentration in deposited sediment			Average concentration in water		
	tons	ft^3	ft^3	Am 241 pci/g	Pu 239/240 pci/g	Sb mg/kg	Am 241 pci/l	Pu 239/240 pci/l	Sb mg/l
SIM-01	1032.29	2.70E+04	4.00E+08	1.70E-02	6.10E-02	2.20E-01	1.80E-06	5.50E-06	1.90E-08
SIM-02	1475.98	3.90E+04	4.20E+08	4.00E-02	1.70E-01	2.40E-01	3.30E-06	1.20E-05	4.30E-08
SIM-03	1085.88	2.90E+04	3.90E+08	1.80E-02	5.90E-02	2.50E-01	1.40E-06	4.20E-06	1.00E-08
SIM-04	1027.75	2.70E+04	4.10E+08	3.00E-02	1.30E-01	7.10E-02	1.10E-06	3.30E-06	6.20E-09
SIM-05	919.64	2.40E+04	4.00E+08	9.30E-03	3.50E-02	6.60E-02	1.40E-06	4.40E-06	1.20E-08
SIM-06	1272.39	3.40E+04	4.00E+08	5.80E-02	2.80E-01	1.50E-01	4.40E-06	1.80E-05	3.90E-08
SIM-07	999.02	2.60E+04	3.90E+08	1.80E-02	6.40E-02	1.90E-01	1.20E-06	3.70E-06	7.60E-09
SIM-08	1315.48	3.50E+04	4.10E+08	2.10E-02	6.60E-02	3.00E-01	1.40E-06	4.20E-06	1.20E-08
SIM-09	843.27	2.20E+04	3.80E+08	1.30E-02	4.90E-02	1.40E-01	8.90E-07	2.40E-06	3.00E-09
SIM-10	877.24	2.30E+04	4.00E+08	7.50E-03	2.80E-02	5.90E-02	9.20E-07	2.50E-06	3.50E-09
SIM-11	777.04	2.10E+04	3.90E+08	6.20E-03	2.20E-02	5.20E-02	9.40E-07	2.60E-06	4.70E-09
SIM-12	1065.75	2.80E+04	4.00E+08	1.50E-02	5.20E-02	2.00E-01	2.80E-06	9.60E-06	3.80E-08
SIM-13	1044.4	2.80E+04	3.90E+08	1.80E-02	6.60E-02	2.90E-01	2.50E-06	8.20E-06	3.10E-08
SIM-14	1073.88	2.80E+04	4.10E+08	1.70E-02	6.50E-02	1.60E-01	2.10E-06	6.90E-06	2.40E-08
SIM-15	1001.15	2.70E+04	4.10E+08	9.00E-03	3.30E-02	8.10E-02	1.10E-06	3.10E-06	6.20E-09
SIM-16	844.62	2.20E+04	3.90E+08	1.70E-02	7.40E-02	5.70E-02	1.30E-06	4.30E-06	3.30E-09
SIM-17	876.99	2.30E+04	3.90E+08	1.40E-02	5.10E-02	1.10E-01	1.10E-06	3.20E-06	6.80E-09
SIM-18	786.96	2.10E+04	3.90E+08	1.10E-02	4.30E-02	9.20E-02	1.10E-06	3.20E-06	6.90E-09
SIM-19	1029.04	2.70E+04	3.90E+08	1.90E-02	7.30E-02	2.20E-01	1.70E-06	5.70E-06	1.30E-08
SIM-20	933.3	2.50E+04	4.00E+08	1.10E-02	3.80E-02	1.00E-01	1.10E-06	3.20E-06	6.70E-09
SIM-21	1419.79	3.80E+04	4.10E+08	2.70E-02	1.00E-01	3.00E-01	2.10E-06	6.90E-06	2.20E-08
SIM-22	913.33	2.40E+04	4.00E+08	1.10E-02	4.40E-02	6.00E-02	1.10E-06	3.10E-06	4.30E-09
SIM-23	706.87	1.90E+04	3.80E+08	1.30E-02	5.30E-02	7.00E-02	1.60E-06	5.00E-06	1.50E-08
SIM-24	640.4	1.70E+04	3.70E+08	4.30E-03	1.80E-02	2.80E-02	9.00E-07	2.50E-06	4.10E-09
SIM-25	812.98	2.20E+04	3.90E+08	1.10E-02	4.40E-02	7.60E-02	1.00E-06	2.90E-06	4.50E-09
SIM-26	1083.86	2.90E+04	4.00E+08	2.10E-02	8.40E-02	2.40E-01	1.20E-06	3.70E-06	9.30E-09
SIM-27	715.13	1.90E+04	3.80E+08	4.90E-03	1.80E-02	5.40E-02	9.80E-07	2.70E-06	5.30E-09
SIM-28	705.42	1.90E+04	3.80E+08	5.00E-03	1.60E-02	4.20E-02	6.60E-07	1.50E-06	2.10E-10
SIM-29	816.13	2.20E+04	3.80E+08	7.30E-03	2.80E-02	8.00E-02	8.90E-07	2.50E-06	3.20E-09
SIM-30	634.26	1.70E+04	3.70E+08	2.20E-03	8.10E-03	1.20E-02	7.00E-07	1.70E-06	1.80E-10
Summary Statistics:									
Maximum	1475.98	3.90E+04	4.20E+08	5.80E-02	2.80E-01	0.3	4.40E-06	1.80E-05	4.3E-08
Minimum	634.26	1.70E+04	3.70E+08	2.20E-03	8.10E-03	0.012	6.6E-07	1.50E-06	1.8E-10
Mean	957.67	2.54E+04	3.94E+08	1.59E-02	6.24E-02	0.13	1.49E-06	4.76E-06	1.21E-08
S.D.	214.13	5.67E+03	1.25E+07	1.14E-02	5.33E-02	0.089	8.31E-07	3.45E-06	1.18E-08
Student t(0.10)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
95% UCL (one-sided)	1025.16	2.72E+04	3.98E+08	0.019	0.079	0.16	1.75E-06	5.84E-06	1.59E-08

TABLE H5-5
SUMMARY STATISTICS OF SIMULATION RESULTS FOR POND-B1

Simulation	Total Deposited Sediment		Total outflow volume from the reach	Average concentration in deposited sediment			Average concentration in water		
				Am 241	Pu 239/240	Sb	Am 241	Pu 239/240	Sb
	tons	ft^3	ft^3	pci/g	pci/g	mg/kg	pci/l	pci/l	mg/l
SIM-01	34.55	9.20E+02	1.40E+05	1.60E-01	1.20E-01	3.00	3.10E-01	6.90E-02	3.50E-13
SIM-02	47.05	1.20E+03	5.50E+05	1.50E-01	1.20E-01	3.30	2.30E-02	5.20E-03	5.70E-12
SIM-03	30.91	8.20E+02	1.50E+05	1.60E-01	1.00E-01	2.40	1.90E-01	4.20E-02	1.00E-12
SIM-04	3.26	8.60E+01	8.50E±04	9.40E-01	3.00E-01	3.40	1.60E-01	3.60E-02	1.10E-12
SIM-05	5.42	1.40E+02	1.30E+04	6.00E-01	2.30E-01	3.40	1.70E-01	3.80E-02	2.40E-12
SIM-06	29.36	7.80E+02	1.90E+05	1.80E-01	1.20E-01	3.00	7.80E-02	1.70E-02	6.20E-10
SIM-07	20.28	5.40E+02	2.10E+05	2.20E-01	1.40E-01	3.20	9.90E-02	2.20E-02	3.00E-12
SIM-08	45.37	1.20E+03	2.40E+05	1.50E-01	1.20E-01	3.10	8.10E-02	1.80E-02	4.00E-13
SIM-09	15.9	4.20E+02	5.80E+04	2.70E-01	1.50E-01	3.40	1.30E-01	2.90E-02	2.20E-12
SIM-10	5.89	1.60E+02	1.40E+05	5.60E-01	2.20E-01	3.40	3.20E-02	7.10E-03	8.70E-12
SIM-11	3.83	1.00E+02	2.60E+04	8.10E-01	2.80E-01	3.40	8.10E-02	1.80E-02	1.10E-12
SIM-12	23.21	6.20E+02	1.10E+05	2.00E-01	1.30E-01	3.10	3.50E-01	8.00E-02	2.40E-13
SIM-13	50.97	1.40E+03	2.30E+05	1.40E-01	1.20E-01	3.10	4.20E-02	9.50E-03	4.20E-11
SIM-14	26.23	7.00E+02	3.20E+05	2.00E-01	1.40E-01	3.30	4.30E-02	9.60E-03	1.30E-12
SIM-15	10.12	2.70E+02	1.20E+05	3.70E-01	1.80E-01	3.40	7.80E-02	1.70E-02	4.00E-12
SIM-16	2.96	7.80E+01	8.30E+04	1.00E+00	3.20E-01	3.40	1.10E-01	2.50E-02	2.50E-12
SIM-17	9.92	2.60E+02	4.10E+04	3.70E-01	1.70E-01	3.30	8.90E-02	2.00E-02	1.60E-12
SIM-18	8.31	2.20E+02	1.20E+05	4.20E-01	1.90E-01	3.30	6.10E-02	1.40E-02	1.20E-12
SIM-19	24.06	6.40E+02	2.30E+05	2.10E-01	1.40E-01	3.40	1.20E-01	2.60E-02	3.10E-12
SIM-20	10.92	2.90E+02	2.40E+05	3.40E-01	1.70E-01	3.30	8.30E-02	1.90E-02	3.20E-13
SIM-21	60.21	1.60E+03	3.60E+05	1.30E-01	1.20E-01	3.10	9.20E-02	2.10E-02	6.40E-12
SIM-22	3.58	9.50E+01	6.00E+04	8.60E-01	2.90E-01	3.40	5.50E-02	1.20E-02	1.60E-12
SIM-23	5.4	1.40E+02	6.90E+04	6.00E-01	2.30E-01	3.40	7.60E-02	1.70E-02	3.80E-12
SIM-24	2.62	6.90E+01	2.00E+04	1.10E+00	3.50E-01	3.40	2.00E-01	4.50E-02	8.30E-12
SIM-25	6.58	1.70E+02	2.90E+04	5.10E-01	2.10E-01	3.40	1.90E-01	4.20E-02	1.70E-12
SIM-26	35.8	9.50E+02	2.80E+05	1.70E-01	1.30E-01	3.30	3.10E-02	6.90E-03	2.50E-11
SIM-27	6.18	1.60E+02	1.10E+05	5.40E-01	2.10E-01	3.40	1.30E-01	2.80E-02	2.30E-12
SIM-28	1.32	3.50E+01	0.00E+00	2.20E+00	5.80E-01	3.40	5.20E-01	1.20E-01	3.70E-12
SIM-29	11.25	3.00E+02	7.00E+04	3.30E-01	1.60E-01	3.20	2.80E-01	6.40E-02	2.60E-13
SIM-30	0.8	2.10E+01	3.60E+04	3.50E+00	8.70E-01	3.20	5.50E-02	1.20E-02	3.00E-12
Summary Statistics:									
Maximum	60.21	1600	5.50E+05	3.50	0.87	3.4	0.52	0.12	6.20E-10
Minimum	0.8	21	0.00E+00	0.13	0.10	2.4	0.023	0.0052	2.4E-13
Mean	18.08	479.47	1.44E+05	0.58	0.22	3.26	0.13	0.03	2.53E-11
S.D.	16.82	447.46	1.23E+05	0.70	0.16	0.209	0.11	0.03	1.13E-10
Student t(0.10)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
95% UCL (one-sided)	23.38	620.49	1.83E+05	0.80	0.27	3.33	0.17	0.04	6.08E-11

TABLE H5-6
SUMMARY STATISTICS OF SIMULATION RESULTS FOR POND-B2

Simulation	Total Deposited Sediment		Total outflow volume from the reach	Average concentration in deposited sediment			Average concentration in water		
	tons	ft^3	ft^3	Am 241 pci/g	Pu 239/240 pci/g	Sb mg/kg	Am 241 pci/l	Pu 239/240 pci/l	Sb mg/l
SIM-01	13.19	3.50E+02	0.00E+00	1.00E-01	3.40E-01	3.40	2.10E-02	5.00E-02	9.00E-10
SIM-02	17.99	4.80E+02	6.00E+05	9.30E-02	2.80E-01	2.60	5.80E-03	1.40E-02	1.60E-08
SIM-03	12.31	3.30E+02	0.00E+00	1.50E-01	4.00E-01	4.80	2.50E-02	6.00E-02	1.00E-09
SIM-04	1.18	3.10E+01	3.30E+04	1.10E+00	2.10E+00	2.30	2.40E-02	5.60E-02	1.10E-09
SIM-05	1.89	5.00E+01	0.00E+00	5.50E-01	1.30E+00	2.40	3.70E-02	8.60E-02	9.50E-10
SIM-06	11.15	3.00E+02	0.00E+00	1.50E-01	3.80E-01	3.30	2.90E-02	6.80E-02	1.80E-08
SIM-07	7.84	2.10E+02	0.00E+00	2.10E-01	4.50E-01	2.80	4.30E-02	1.00E-01	1.30E-09
SIM-08	17.71	4.70E+02	1.10E+05	1.10E-01	3.00E-01	3.10	3.30E-02	7.70E-02	1.20E-09
SIM-09	5.71	1.50E+02	0.00E+00	1.60E-01	5.30E-01	2.40	2.30E-02	5.30E-02	3.30E-07
SIM-10	2.17	5.80E+01	2.00E+04	6.80E-01	1.20E+00	2.40	2.20E-02	5.20E-02	9.80E-10
SIM-11	1.39	3.70E+01	0.00E+00	1.10E+00	1.80E+00	2.30	2.90E-02	6.70E-02	1.10E-09
SIM-12	8.71	2.30E+02	0.00E+00	1.60E-01	4.30E-01	3.20	2.90E-02	6.70E-02	4.60E-11
SIM-13	19.31	5.10E+02	2.20E+05	9.70E-02	2.80E-01	2.90	1.00E-02	2.40E-02	2.30E-08
SIM-14	9.94	2.60E+02	1.50E+05	1.50E-01	3.80E-01	2.50	1.70E-02	4.10E-02	4.00E-09
SIM-15	3.67	9.70E+01	5.80E+03	3.80E-01	7.70E-01	2.30	4.30E-02	1.00E-01	1.10E-09
SIM-16	1.13	3.00E+01	0.00E+00	8.40E-01	2.10E+00	2.20	2.20E-02	5.20E-02	1.10E-09
SIM-17	3.68	9.80E+01	0.00E+00	4.10E-01	7.80E-01	2.60	1.80E-02	4.20E-02	1.10E-09
SIM-18	3.18	8.40E+01	0.00E+00	4.70E-01	8.70E-01	2.40	2.20E-02	5.10E-02	1.50E-09
SIM-19	9.1	2.40E+02	7.90E+04	1.10E-01	3.90E-01	2.40	2.00E-02	4.60E-02	3.70E-09
SIM-20	4.21	1.10E+02	8.10E+04	3.10E-01	6.80E-01	2.50	2.40E-02	5.50E-02	1.20E-09
SIM-21	23.03	6.10E+02	1.30E+05	7.60E-02	2.60E-01	2.90	2.40E-02	5.70E-02	1.60E-08
SIM-22	1.31	3.50E+01	0.00E+00	1.10E+00	1.90E+00	2.30	1.80E-02	4.20E-02	1.10E-09
SIM-23	2.05	5.40E+01	0.00E+00	7.20E-01	1.30E+00	2.20	2.30E-02	5.50E-02	1.20E-09
SIM-24	0.97	2.60E+01	0.00E+00	9.60E-01	2.40E+00	2.20	3.60E-02	8.50E-02	1.20E-09
SIM-25	2.35	6.20E+01	0.00E+00	3.90E-01	1.10E+00	2.30	3.30E-02	7.70E-02	1.20E-09
SIM-26	13.68	3.60E+02	2.30E+05	1.20E-01	3.20E-01	2.70	1.10E-02	2.60E-02	1.10E-08
SIM-27	2.33	6.20E+01	0.00E+00	6.10E-01	1.10E+00	2.30	2.90E-02	6.70E-02	9.80E-10
SIM-28	0.51	1.40E+01	0.00E+00	1.80E+00	4.40E+00	2.10	6.00E-02	1.40E-01	3.60E-11
SIM-29	4.43	1.20E+02	0.00E+00	2.40E-01	6.50E-01	2.80	2.20E-02	5.20E-02	1.00E-09
SIM-30	0.38	1.00E+01	0.00E+00	3.80E+00	6.10E+00	1.90	2.90E-02	6.70E-02	1.10E-09
Summary Statistics:									
Maximum	23.03	610	6.00E+05	3.80	6.10	4.8	0.06	0.14	3.30E-07
Minimum	0.38	10	0.00E+00	0.08	0.26	1.9	0.0058	0.014	3.60E-11
Mean	6.88	182.60	5.53E+04	0.57	1.18	2.62	0.03	0.06	1.48E-08
S.D.	6.47	171.54	1.23E+05	0.74	1.29	0.552	0.01	0.02	5.98E-08
Student t(0.10)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
95% UCL (one-sided)	8.92	236.67	9.39E+04	0.80	1.58	2.79	0.03	0.07	3.37E-08

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TABLE H5-7
SUMMARY STATISTICS OF SIMULATION RESULTS FOR POND-B3

Simulation	Total Deposited Sediment		Total outflow volume from the reach	Average concentration in deposited sediment			Average concentration in water		
	tons	ft^3	ft^3	Am 241 pci/g	Pu 239/240 pci/g	Sb mg/kg	Am 241 pci/l	Pu 239/240 pci/l	Sb mg/l
SIM-01	28.31	7.50E+02	2.20E+08	9.60E-02	1.90E-01	1.10	3.30E-05	1.10E-04	6.60E-09
SIM-02	38.72	1.00E+03	2.30E+08	7.10E-02	1.70E-01	1.10	3.30E-05	1.10E-04	2.50E-09
SIM-03	25.71	6.80E+02	2.20E+08	9.80E-02	1.90E-01	0.99	3.20E-05	1.10E-04	6.80E-11
SIM-04	2.87	7.60E+01	2.20E+08	3.60E-01	9.20E-01	1.10	3.30E-05	1.10E-04	7.20E-11
SIM-05	4.5	1.20E+02	2.20E+08	3.10E-01	6.40E-01	1.10	3.10E-05	1.00E-04	2.70E-25
SIM-06	24.58	6.50E+02	2.20E+08	8.40E-02	2.00E-01	1.00	3.20E-05	1.10E-04	6.90E-11
SIM-07	16.81	4.50E+02	2.20E+08	9.60E-02	2.50E-01	1.10	3.20E-05	1.10E-04	1.40E-15
SIM-08	37.1	9.80E+02	2.30E+08	6.80E-02	1.60E-01	1.00	3.20E-05	1.10E-04	1.50E-10
SIM-09	13.43	3.60E+02	2.20E+08	1.50E-01	2.90E-01	1.00	3.30E-05	1.10E-04	7.40E-11
SIM-10	5.04	1.30E+02	2.20E+08	2.00E-01	5.70E-01	1.10	3.10E-05	1.00E-04	7.50E-11
SIM-11	3.33	8.80E+01	2.20E+08	2.80E-01	8.00E-01	1.10	3.30E-05	1.10E-04	1.30E-14
SIM-12	19.45	5.20E+02	2.20E+08	1.00E-01	2.20E-01	0.98	3.30E-05	1.10E-04	6.20E-11
SIM-13	42.1	1.10E+03	2.30E+08	6.60E-02	1.60E-01	1.10	3.30E-05	1.10E-04	1.90E-08
SIM-14	21.64	5.70E+02	2.30E+08	9.20E-02	2.20E-01	1.10	3.30E-05	1.10E-04	4.10E-09
SIM-15	8.41	2.20E+02	2.20E+08	1.50E-01	3.90E-01	1.10	3.30E-05	1.10E-04	9.00E-16
SIM-16	2.56	6.80E+01	2.20E+08	5.50E-01	1.10E+00	1.10	3.20E-05	1.10E-04	6.80E-11
SIM-17	8.39	2.20E+02	2.20E+08	1.40E-01	3.80E-01	1.00	3.20E-05	1.10E-04	6.80E-11
SIM-18	6.94	1.80E+02	2.20E+08	1.60E-01	4.40E-01	1.10	3.30E-05	1.10E-04	5.90E-16
SIM-19	19.66	5.20E+02	2.30E+08	1.20E-01	2.30E-01	1.10	3.30E-05	1.10E-04	4.90E-09
SIM-20	8.94	2.40E+02	2.20E+08	1.60E-01	3.80E-01	1.10	3.10E-05	1.00E-04	3.60E-10
SIM-21	49.76	1.30E+03	2.30E+08	6.80E-02	1.50E-01	1.00	3.30E-05	1.10E-04	1.20E-08
SIM-22	2.98	7.90E+01	2.20E+08	3.10E-01	8.90E-01	1.10	3.20E-05	1.10E-04	6.80E-11
SIM-23	4.39	1.20E+02	2.20E+08	2.20E-01	6.40E-01	1.10	3.20E-05	1.10E-04	6.80E-11
SIM-24	2.31	6.10E+01	2.20E+08	6.10E-01	1.20E+00	1.10	3.20E-05	1.10E-04	1.60E-12
SIM-25	5.66	1.50E+02	2.20E+08	2.80E-01	5.30E-01	1.00	3.20E-05	1.10E-04	6.80E-11
SIM-26	29.57	7.80E+02	2.30E+08	7.50E-02	1.80E-01	1.00	3.30E-05	1.10E-04	3.20E-10
SIM-27	5.24	1.40E+02	2.20E+08	2.10E-01	5.50E-01	1.10	3.20E-05	1.10E-04	6.90E-11
SIM-28	1.18	3.10E+01	2.20E+08	1.10E+00	2.20E+00	1.00	3.30E-05	1.10E-04	1.40E-15
SIM-29	9.31	2.50E+02	2.20E+08	1.90E-01	3.70E-01	1.10	3.20E-05	1.10E-04	6.90E-11
SIM-30	0.69	1.80E+01	2.20E+08	1.10E+00	3.50E+00	1.10	3.30E-05	1.10E-04	7.40E-11
Summary Statistics:									
Maximum	49.76	1300	2.30E+08	1.10	3.50	1.1	3.30E-05	1.10E-04	1.9E-08
Minimum	0.69	18	2.20E+08	0.066	0.15	0.98	3.10E-05	1.00E-04	2.7E-25
Mean	14.99	395.03	2.22E+08	0.25	0.60	1.07	3.24E-05	1.09E-04	1.70E-09
S.D.	13.83	361.94	4.30E+06	0.27	0.70	0.050	6.75E-07	3.05E-06	4.19E-09
Student t(0.10)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
95% UCL (one-sided)	19.34	509.11	2.24E+08	0.33	0.82	1.08	3.26E-05	1.10E-04	3.02E-09

TABLE H5-8
SUMMARY STATISTICS OF SIMULATION RESULTS FOR POND-B4

Simulation	Total Deposited Sediment		Total outflow volume from the reach	Average concentration in deposited sediment			Average concentration in water		
	tons	ft^3	ft^3	Am 241 pci/g	Pu 239/240 pci/g	Sb mg/kg	Am 241 pci/l	Pu 239/240 pci/l	Sb mg/l
SIM-01	2348.55	6.20E+04	3.30E+08	3.70E-03	9.50E-03	1.70E-01	9.30E-05	3.10E-04	9.60E-08
SIM-02	2875.48	7.60E+04	3.30E+08	3.40E-03	9.30E-03	1.50E-01	2.30E-05	7.20E-05	1.10E-07
SIM-03	2341.96	6.20E+04	3.20E+08	3.20E-03	7.10E-03	1.50E-01	1.50E-04	5.00E-04	9.10E-08
SIM-04	2438.53	6.50E+04	3.30E+08	3.70E-03	9.20E-03	1.60E-01	4.10E-05	1.30E-04	1.00E-07
SIM-05	2462.69	6.50E+04	3.30E+08	3.20E-03	6.80E-03	1.50E-01	2.20E-04	7.40E-04	9.90E-08
SIM-06	2290.52	6.10E+04	3.30E+08	3.80E-03	9.90E-03	1.70E-01	1.70E-04	5.50E-04	9.90E-08
SIM-07	2252.86	6.00E+04	3.20E+08	3.30E-03	7.70E-03	1.50E-01	2.00E-05	6.30E-05	9.30E-08
SIM-08	2757.94	7.30E+04	3.30E+08	3.40E-03	8.70E-03	1.60E-01	5.30E-05	1.70E-04	1.10E-07
SIM-09	2015.03	5.30E+04	3.20E+08	3.50E-03	7.80E-03	1.60E-01	5.40E-05	1.80E-04	8.50E-08
SIM-10	2323.51	6.20E+04	3.30E+08	3.60E-03	8.90E-03	1.60E-01	2.30E-05	7.30E-05	9.80E-08
SIM-11	2277.43	6.00E+04	3.20E+08	3.10E-03	6.50E-03	1.40E-01	2.00E-04	6.60E-04	8.60E-08
SIM-12	2452.78	6.50E+04	3.30E+08	3.30E-03	7.10E-03	1.60E-01	3.60E-04	1.20E-03	9.50E-08
SIM-13	2070.61	5.50E+04	3.20E+08	4.20E-03	1.10E-02	1.90E-01	2.20E-05	6.90E-05	9.20E-08
SIM-14	2523.15	6.70E+04	3.30E+08	3.50E-03	8.30E-03	1.60E-01	8.30E-05	2.70E-04	1.10E-07
SIM-15	2664.99	7.10E+04	3.30E+08	3.30E-03	7.10E-03	1.50E-01	9.90E-05	3.20E-04	1.10E-07
SIM-16	2110.91	5.60E+04	3.30E+08	3.50E-03	7.30E-03	1.70E-01	3.00E-05	9.50E-05	9.10E-08
SIM-17	2113.45	5.60E+04	3.20E+08	3.60E-03	8.20E-03	1.70E-01	4.90E-05	1.60E-04	9.20E-08
SIM-18	2678.48	7.10E+04	3.20E+08	2.70E-03	5.90E-03	1.20E-01	8.50E-05	2.80E-04	8.50E-08
SIM-19	2341.43	6.20E+04	3.20E+08	3.30E-03	7.90E-03	1.50E-01	3.80E-05	1.20E-04	9.20E-08
SIM-20	3058.7	8.10E+04	3.30E+08	2.70E-03	6.60E-03	1.20E-01	1.10E-04	3.60E-04	9.80E-08
SIM-21	2720.06	7.20E+04	3.30E+08	3.40E-03	8.50E-03	1.60E-01	2.10E-05	6.80E-05	1.10E-07
SIM-22	2378.06	6.30E+04	3.30E+08	3.30E-03	7.00E-03	1.60E-01	2.00E-05	6.20E-05	9.90E-08
SIM-23	1805.19	4.80E+04	3.20E+08	3.40E-03	7.10E-03	1.60E-01	7.00E-05	2.30E-04	7.60E-08
SIM-24	1735.75	4.60E+04	3.20E+08	3.50E-03	7.40E-03	1.70E-01	2.60E-05	8.30E-05	7.30E-08
SIM-25	2069.39	5.50E+04	3.20E+08	3.60E-03	7.70E-03	1.70E-01	5.90E-05	1.90E-04	9.00E-08
SIM-26	2397.46	6.40E+04	3.30E+08	3.70E-03	9.70E-03	1.70E-01	9.90E-05	3.30E-04	9.80E-08
SIM-27	1996.46	5.30E+04	3.20E+08	3.30E-03	7.00E-03	1.50E-01	4.60E-05	1.50E-04	8.30E-08
SIM-28	1888.24	5.00E+04	3.20E+08	3.50E-03	7.30E-03	1.60E-01	3.60E-05	1.20E-04	8.10E-08
SIM-29	2154.74	5.70E+04	3.20E+08	3.40E-03	8.00E-03	1.60E-01	5.70E-05	1.90E-04	8.90E-08
SIM-30	1855.19	4.90E+04	3.20E+08	3.30E-03	6.80E-03	1.60E-01	3.30E-05	1.10E-04	7.80E-08
Summary Statistics:									
Maximum	3058.7	81000	3.30E+08	4.20E-03	1.10E-02	0.19	3.60E-04	1.20E-03	1.10E-07
Minimum	1735.75	46000	3.20E+08	2.70E-03	5.90E-03	0.12	2.00E-05	6.20E-05	7.30E-08
Mean	2313.32	61333.33	3.25E+08	3.41E-03	7.91E-03	0.16	7.97E-05	2.62E-04	9.36E-08
S.D.	322.12	8539.29	5.09E+06	2.91E-04	1.18E-03	0.014	7.55E-05	2.52E-04	1.03E-08
Student t(0.10)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
95% UCL (one-sided)	2414.84	64024.69	3.27E+08	3.51E-03	8.28E-03	0.16	1.03E-04	3.41E-04	9.69E-08

TABLE H5-9
SUMMARY STATISTICS OF SIMULATION RESULTS FOR POND-B5

Simulation	Total Deposited Sediment		Total outflow volume from the reach	Average concentration in deposited sediment			Average concentration in water		
	tons	ft^3	ft^3	Am 241 pci/g	Pu 239/240 pci/g	Sb mg/kg	Am 241 pci/l	Pu 239/240 pci/l	Sb mg/l
SIM-01	691.65	1.80E+04	3.10E+08	1.50E-02	3.20E-02	3.90E-01	2.80E-06	6.10E-06	5.10E-08
SIM-02	1121.17	3.00E+04	3.20E+08	1.30E-02	3.10E-02	4.30E-01	3.40E-06	8.00E-06	8.80E-08
SIM-03	796.66	2.10E+04	3.10E+08	1.40E-02	3.40E-02	4.40E-01	2.90E-06	6.50E-06	6.30E-08
SIM-04	660.5	1.80E+04	3.20E+08	1.40E-02	2.30E-02	3.90E-01	2.70E-06	5.60E-06	4.80E-08
SIM-05	668.32	1.80E+04	3.10E+08	1.40E-02	2.20E-02	4.00E-01	2.50E-06	5.30E-06	4.70E-08
SIM-06	713.15	1.90E+04	3.20E+08	1.60E-02	3.10E-02	3.90E-01	2.60E-06	5.70E-06	5.60E-08
SIM-07	750.38	2.00E+04	3.10E+08	1.40E-02	2.80E-02	4.20E-01	3.20E-06	6.70E-06	6.80E-08
SIM-08	960.79	2.50E+04	3.20E+08	1.20E-02	3.00E-02	4.30E-01	3.30E-06	7.60E-06	8.30E-08
SIM-09	572.96	1.50E+04	3.10E+08	1.60E-02	3.20E-02	4.00E-01	2.60E-06	5.60E-06	4.30E-08
SIM-10	613.19	1.60E+04	3.20E+08	1.60E-02	2.60E-02	3.90E-01	2.60E-06	5.30E-06	4.40E-08
SIM-11	591.8	1.60E+04	3.10E+08	1.40E-02	2.40E-02	4.00E-01	2.70E-06	5.50E-06	4.30E-08
SIM-12	771.98	2.00E+04	3.20E+08	1.40E-02	2.90E-02	4.30E-01	4.80E-06	1.20E-05	5.40E-08
SIM-13	665.49	1.80E+04	3.10E+08	1.30E-02	3.40E-02	4.10E-01	3.20E-06	7.50E-06	5.50E-08
SIM-14	793.86	2.10E+04	3.20E+08	1.30E-02	2.70E-02	4.10E-01	2.90E-06	6.40E-06	6.30E-08
SIM-15	799.04	2.10E+04	3.20E+08	1.30E-02	2.30E-02	4.00E-01	3.00E-06	6.20E-06	6.30E-08
SIM-16	499.56	1.30E+04	3.10E+08	1.60E-02	2.60E-02	3.80E-01	2.40E-06	4.80E-06	3.80E-08
SIM-17	579.47	1.50E+04	3.10E+08	1.50E-02	2.50E-02	3.90E-01	2.40E-06	4.90E-06	4.20E-08
SIM-18	475.58	1.30E+04	3.10E+08	1.40E-02	2.40E-02	3.90E-01	2.40E-06	4.70E-06	3.70E-08
SIM-19	837.35	2.20E+04	3.10E+08	1.30E-02	2.60E-02	4.20E-01	3.10E-06	6.60E-06	6.80E-08
SIM-20	667.04	1.80E+04	3.10E+08	1.50E-02	2.60E-02	4.00E-01	2.50E-06	5.20E-06	5.30E-08
SIM-21	1043.79	2.80E+04	3.20E+08	1.30E-02	3.40E-02	4.50E-01	3.40E-06	8.10E-06	8.60E-08
SIM-22	661.94	1.80E+04	3.10E+08	1.40E-02	2.20E-02	3.90E-01	2.80E-06	5.70E-06	4.80E-08
SIM-23	497.06	1.30E+04	3.00E+08	1.40E-02	2.50E-02	4.00E-01	2.70E-06	5.40E-06	4.30E-08
SIM-24	409.72	1.10E+04	3.00E+08	1.70E-02	2.70E-02	3.80E-01	2.60E-06	5.30E-06	3.10E-08
SIM-25	521.47	1.40E+04	3.10E+08	1.60E-02	2.50E-02	3.80E-01	2.40E-06	4.70E-06	4.20E-08
SIM-26	732.56	1.90E+04	3.20E+08	1.30E-02	3.00E-02	4.10E-01	3.00E-06	6.40E-06	5.70E-08
SIM-27	544.7	1.40E+04	3.10E+08	1.70E-02	2.80E-02	3.90E-01	2.60E-06	5.20E-06	4.50E-08
SIM-28	479.92	1.30E+04	3.10E+08	1.70E-02	2.60E-02	3.80E-01	2.50E-06	4.80E-06	3.80E-08
SIM-29	649.57	1.70E+04	3.10E+08	1.50E-02	2.70E-02	3.90E-01	2.70E-06	5.60E-06	5.00E-08
SIM-30	445.57	1.20E+04	3.00E+08	1.50E-02	2.30E-02	3.90E-01	2.30E-06	4.40E-06	3.20E-08
Summary Statistics:									
Maximum	1121.17	30000	3.20E+08	1.70E-02	3.40E-02	0.45	4.80E-06	1.20E-05	8.8E-08
Minimum	409.72	11000	3.00E+08	1.20E-02	2.20E-02	0.38	2.30E-06	4.40E-06	3.1E-08
Mean	673.87	17866.67	3.12E+08	1.45E-02	2.73E-02	0.40	2.83E-06	6.06E-06	5.26E-08
S.D.	170.48	4508.48	6.26E+06	1.38E-03	3.63E-03	0.019	4.86E-07	1.49E-06	1.49E-08
Student t(0.10)	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
95% UCL (one-sided)	727.61	19287.62	3.14E+08	0.015	0.028	0.41	2.99E-06	6.53E-06	5.73E-08

TABLE H5-10

MODELED NEWLY DEPOSITED SEDIMENT VOLUME AND CHEMICAL CONCENTRATIONS IN SEDIMENT AND SURFACE WATER (1)

	Total Deposited Sediment at 30 year		Depth (2)	Average concentration in deposited sediment			Average concentration in water		
	tons	ft^3	(ft)	Am 241 pci/g	Pu 239/240 pci/g	Sb mg/kg	Am 241 pci/l	Pu 239/240 pci/l	Sb mg/l
Pond-A1	18.34	4.90E+02	0.015	0.213	0.811	4.18	0.014	0.043	4.42E-08
Pond-A2	43.20	1.14E+03	0.024	0.060	0.503	1.62	0.013	0.042	1.21E-08
Pond-A3	6334	1.68E+05	6.50	0.023	0.047	0.32	2.04E-05	4.65E-05	1.92E-07
Pond-A4	1025.2	2.72E+04	2.69	0.019	0.079	0.16	1.75E-06	5.84E-06	1.59E-08
Pond-B1	23.38	6.20E+02	0.049	0.800	0.270	3.33	0.167	0.038	6.08E-11
Pond-B2	8.92	2.37E+02	0.0070	0.805	1.583	2.79	0.029	0.069	3.37E-08
Pond-B3	19.34	5.09E+02	0.030	0.335	0.824	1.08	3.26E-05	1.10E-04	3.02E-09
Pond-B4	2414.8	6.40E+04	5.73	0.0035	0.0083	0.16	1.03E-04	3.41E-04	9.69E-08
Pond-B5	727.6	1.93E+04	3.59	0.015	0.028	0.41	2.99E-06	6.53E-06	5.73E-08
R07	153.1	4.09E+03	0.86	0.098	0.196	19.56	7.65E-05	1.82E-04	1.53E-05

Notes:
1) Values shown are 95% one-sided UCLs calculated assuming normal distribution of data; see Tables 5-1 through 5-10.
2) Net deposition is based on the current bathymetry of the ponds and creek and the elevation-capacity curve of the ponds.

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TABLE 5-11
LONG-TERM AVERAGE CONCENTRATIONS IN SEDIMENT (0 - 2') AND SURFACE WATER

Pond/Reach ID	Initial Concentration (1)			Concentrations in newly Deposited Sediment (2)			Depth of Deposit at 30 yr	Weighted Av. Concentration for Risk Assessment at 15 yr (3)					
								Sediment			Water		
	AM-241	PU-239/240	Antimony	AM-241	PU-239/240	Antimony		AM-241	PU-239/240	Antimony	AM-241	PU-239/240	Antimony
	(pci/g)	(pci/g)	(mg/kg)	(pci/g)	(pci/g)	(mg/kg)	(ft)	(pci/g)	(pci/g)	(mg/kg)	(pci/l)	(pci/l)	(mg/l)
A-1 (R-25)	9.31	29.04	20.52	0.213	0.811	4.18	0.015	9.28	28.93	20.46	0.014	0.043	4.42E-08
A-2 (R-26)	1.011	3.187	12	0.060	0.503	1.62	0.024	1.005	3.171	11.938	0.013	0.042	1.21E-08
A-3 (R-10)	0.413	1.214	13.5	0.023	0.047	0.32	6.50	0.023	0.047	0.317	2.04E-05	4.65E-05	1.92E-07
A-4 (R-12)	0.0695	0.155	28.75	0.019	0.079	0.16	2.69	0.036	0.104	9.524	1.75E-06	5.84E-06	1.59E-08
B-1 (R-21)	100.57	56.33	12	0.800	0.270	3.33	0.049	99.34	55.64	11.893	0.167	0.038	6.08E-11
B-2 (R-22)	11.378	26.76	12	0.805	1.583	2.79	0.0070	11.36	26.72	11.984	0.029	0.069	3.37E-08
B-3 (R-14)	23.69	78.89	47.4	0.335	0.824	1.08	0.030	23.51	78.30	47.049	3.26E-05	1.10E-04	3.02E-09
B-4 (R-16)	0.848	2.61	17.075	0.0035	0.0083	0.16	5.73	0.004	0.008	0.162	1.03E-04	3.41E-04	9.69E-08
B-5 (R-18)	0.128	0.237	10.625	0.015	0.028	0.41	3.59	0.027	0.050	1.455	2.99E-06	6.53E-06	5.73E-08
Indiana St. (R7)	0.04	0.08	8.2	0.098	0.196	19.56	0.86	0.052	0.105	10.64	7.65E-05	1.82E-04	1.53E-05

(1) Arithmetic mean of 5 samples collected in each pond, 0- to 2- feet interval;
"Indiana St (R7)" initial concentrations are based on sediment samples from the W&I pond and stream sediment samples downstream of pond A-4.
(2) Modeled 95% UCL concentrations from Tables 5-11.
(3) Calculated using Equations 5-9 or 5-10 (see text).

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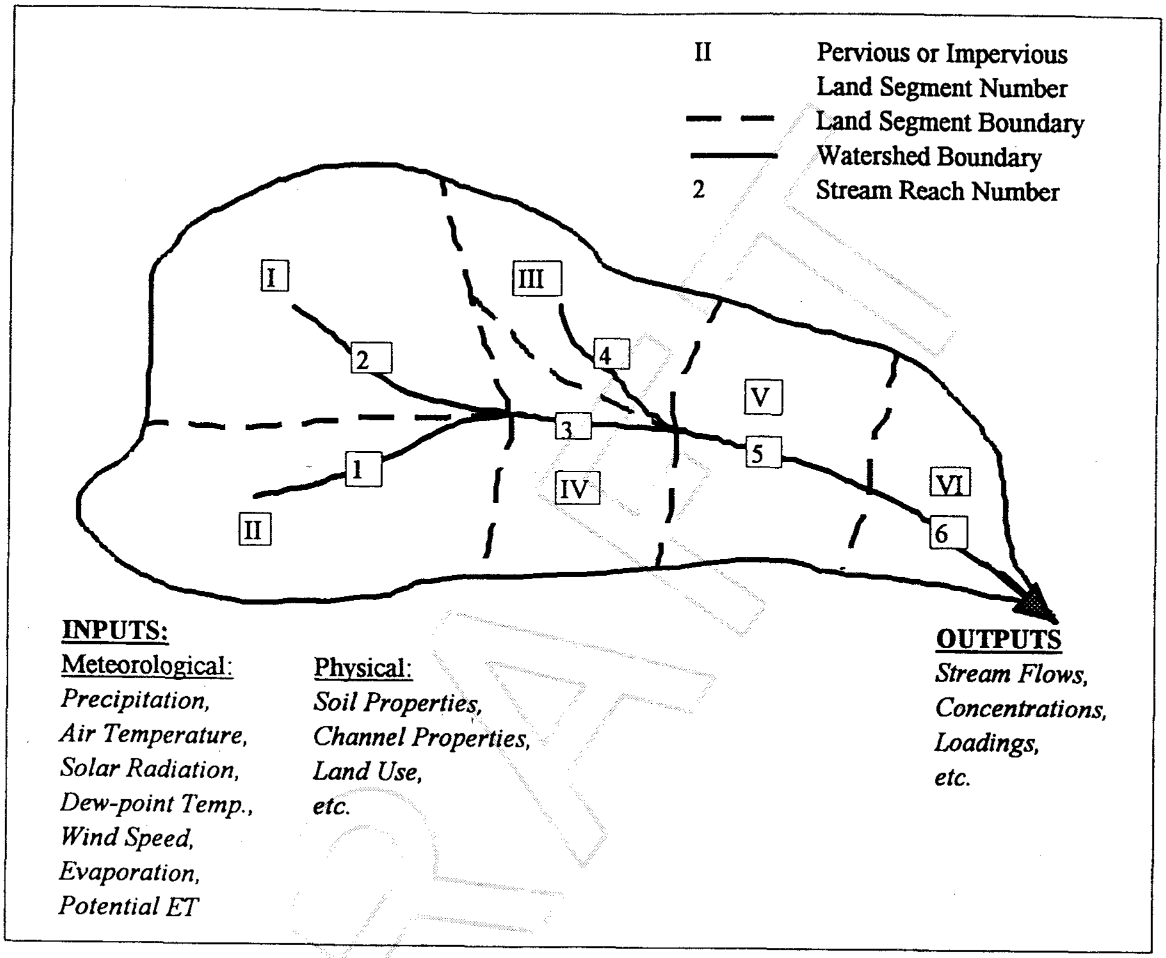

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SUBDIVISION OF A BASIN
FOR HSPF SIMULATION

FIGURE H2-1

JUNE 1995

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APPLICATION MODULES

PERLND	IMPLND	RCHRES
Snow	*Snow*	*Hydraulics*
Water	*Water*	*Conservative*
Sediment	*Solids*	*Temperature*
Quality	*Quality*	*Sediment*
Pesticide		*Nonconservative*
Nitrogen		*BOD/DO*
Phosphorus		*Nitrogen*
Tracer		*Phosphorus*
		Carbon
		Plankton

UTILITY MODULES

COPY	PLTGEN	DISPLY
Data Transfer	*Plot Data*	*Tabulate, summarize*

DURANL	GENER	MUTSIN
Duration Analysis	*Transform or combine*	*Input sequential Time-series data*

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"OPERATING MODULES" IN THE HSPF SOFTWARE

FIGURE H2-2

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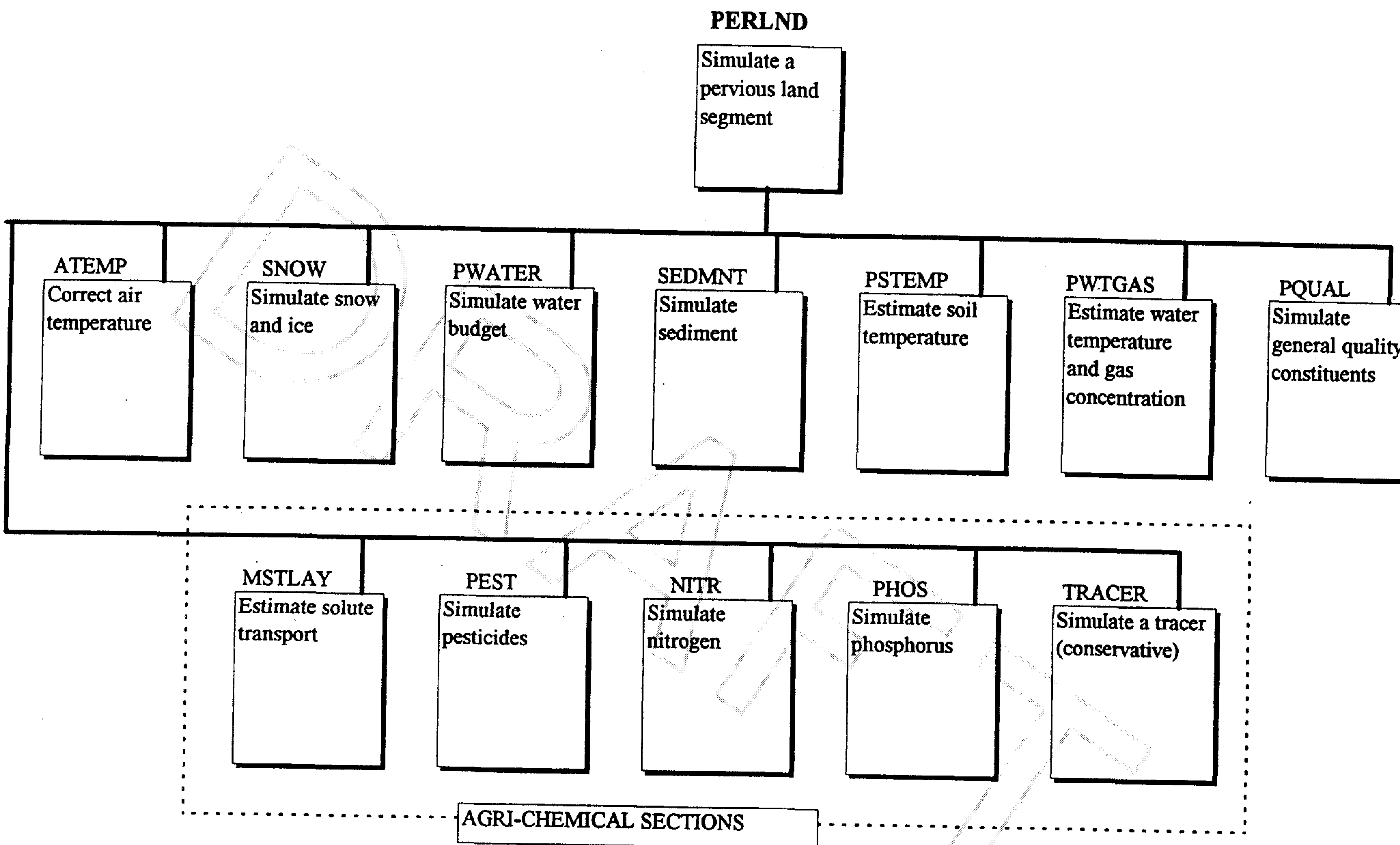
OU6RI308



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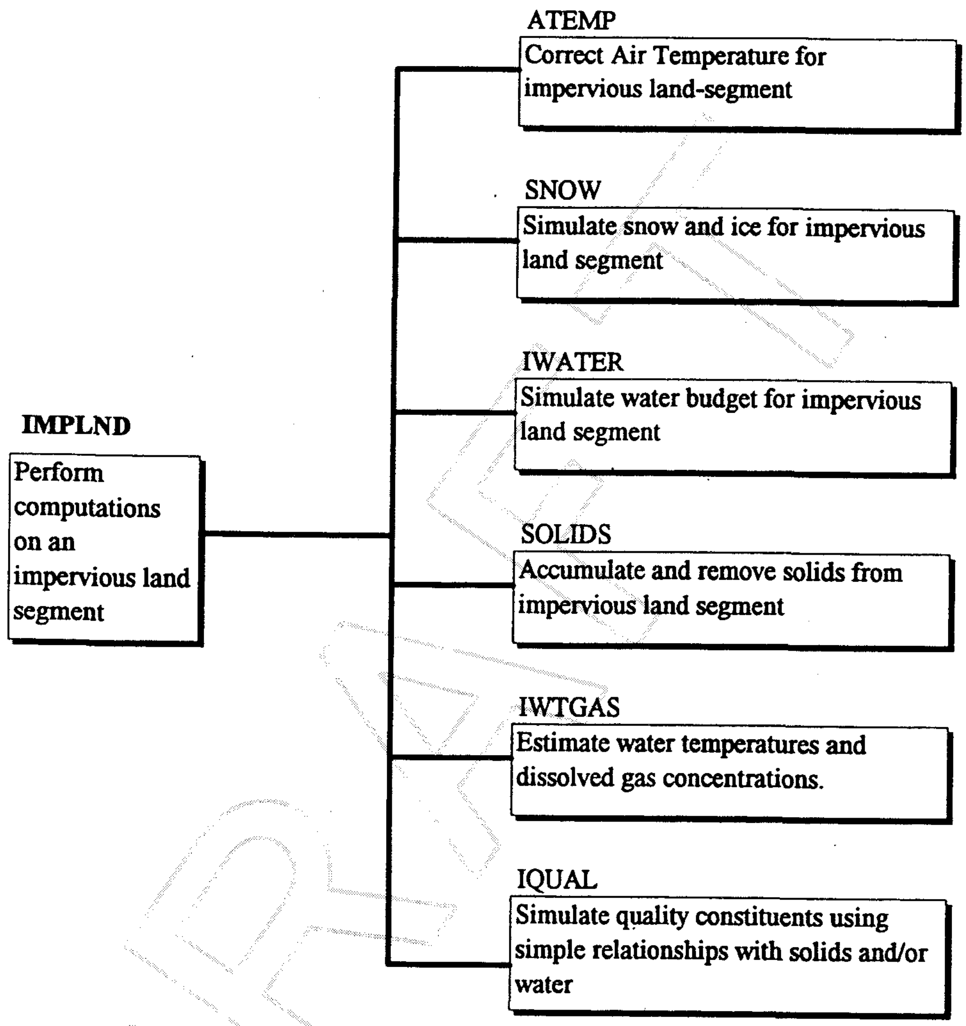
STRUCTURE CHART FOR THE PERVIOUS LAND-SEGMENT MODULE

FIGURE H2-3

JUNE 1995

OU6RI309



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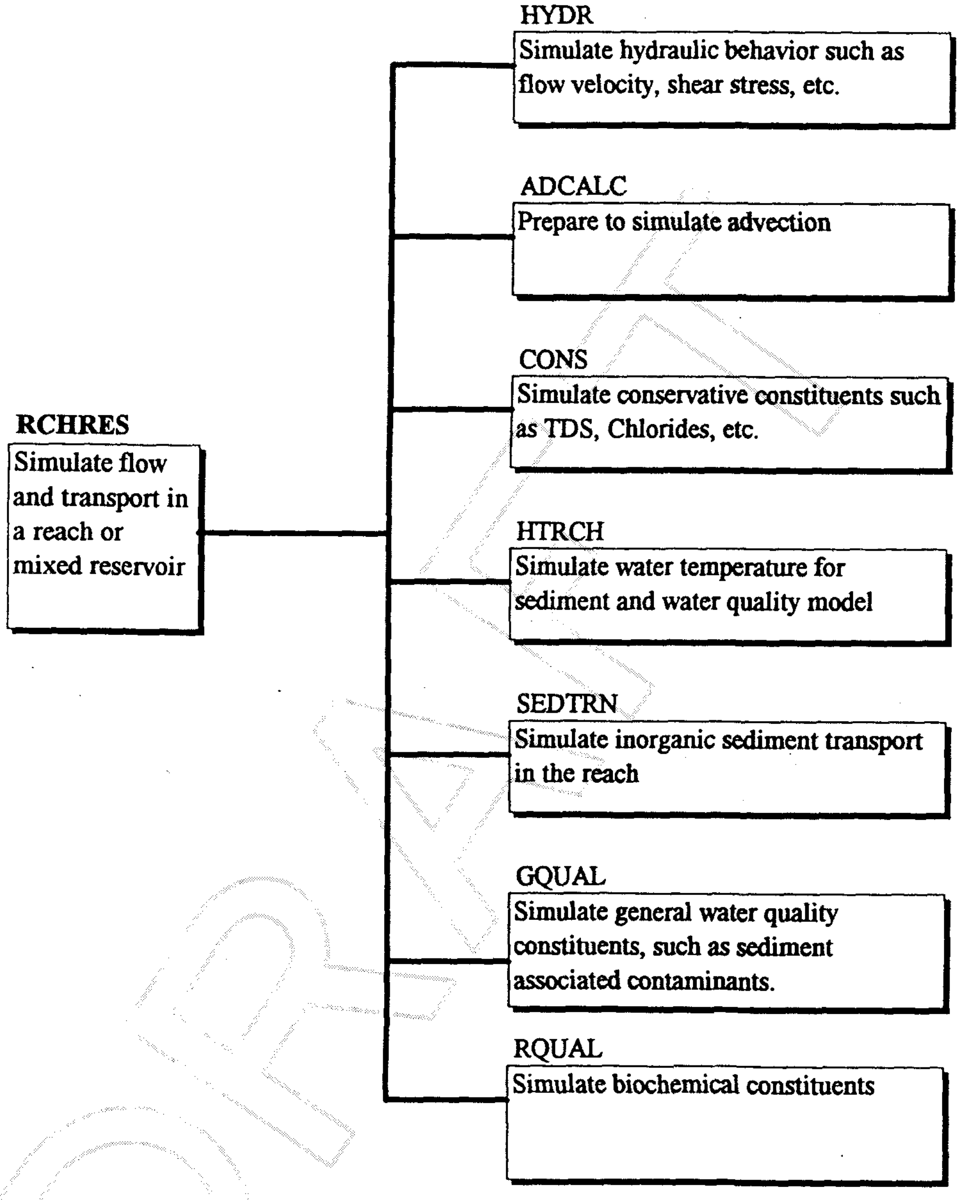
STRUCTURE CHART FOR THE IMPERVIOUS LAND-SEGMENT MODULE

FIGURE H2-4

JUNE 1995

OU6RI310



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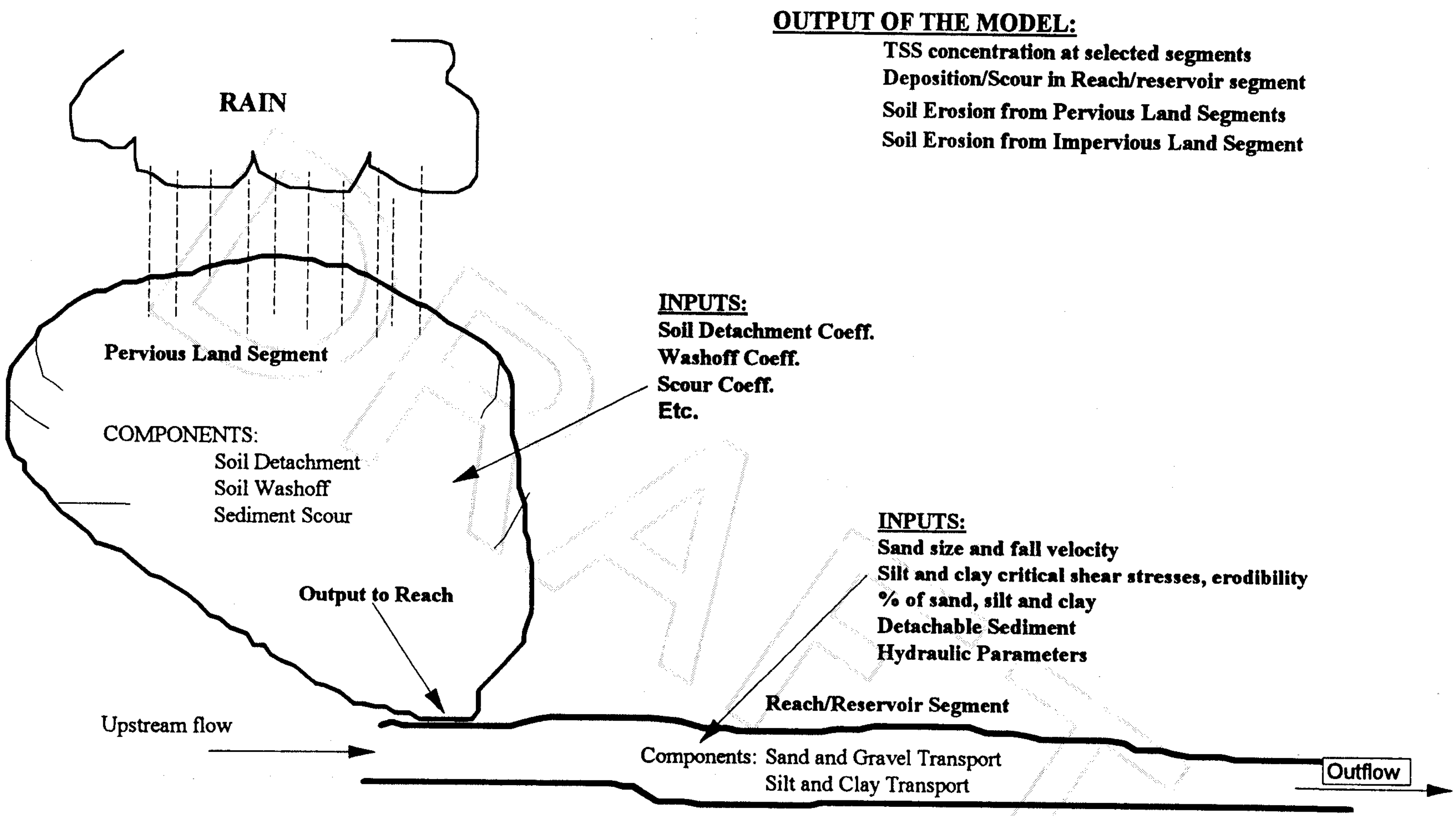
STRUCTURE CHART FOR THE REACH/RESERVOIR MODULE

FIGURE H2-5

JUNE 1995

OU6RI311



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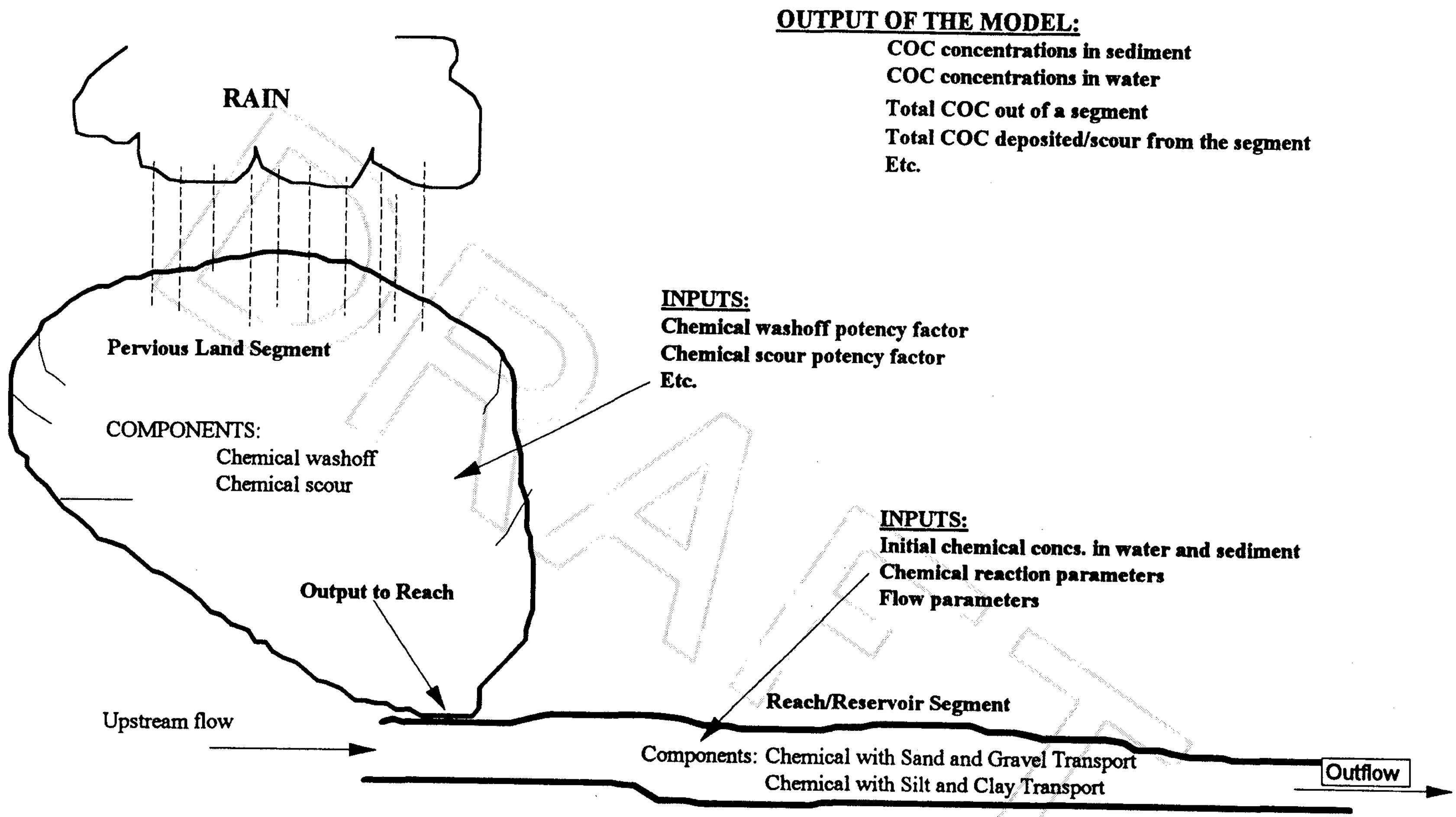
CONCEPTUAL HSPF SEDIMENT TRANSPORT MODEL

FIGURE H2-6

JUNE 1995

OU6RI312



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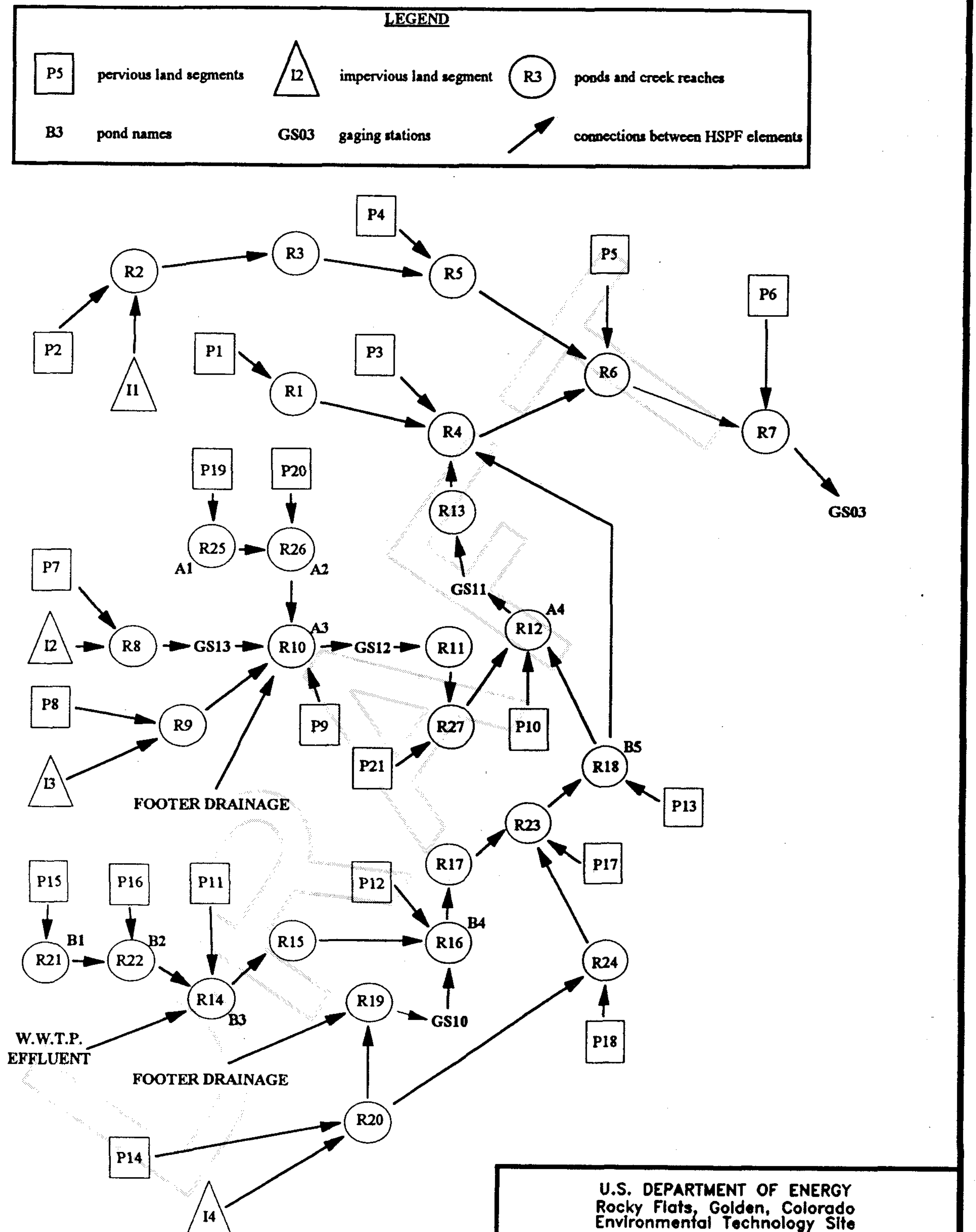
CONCEPTUAL HSPF
SEDIMENT-ASSOCIATED CHEMICAL
TRANSPORT MODEL

FIGURE H2-7

JUNE 1995

OU6RI313



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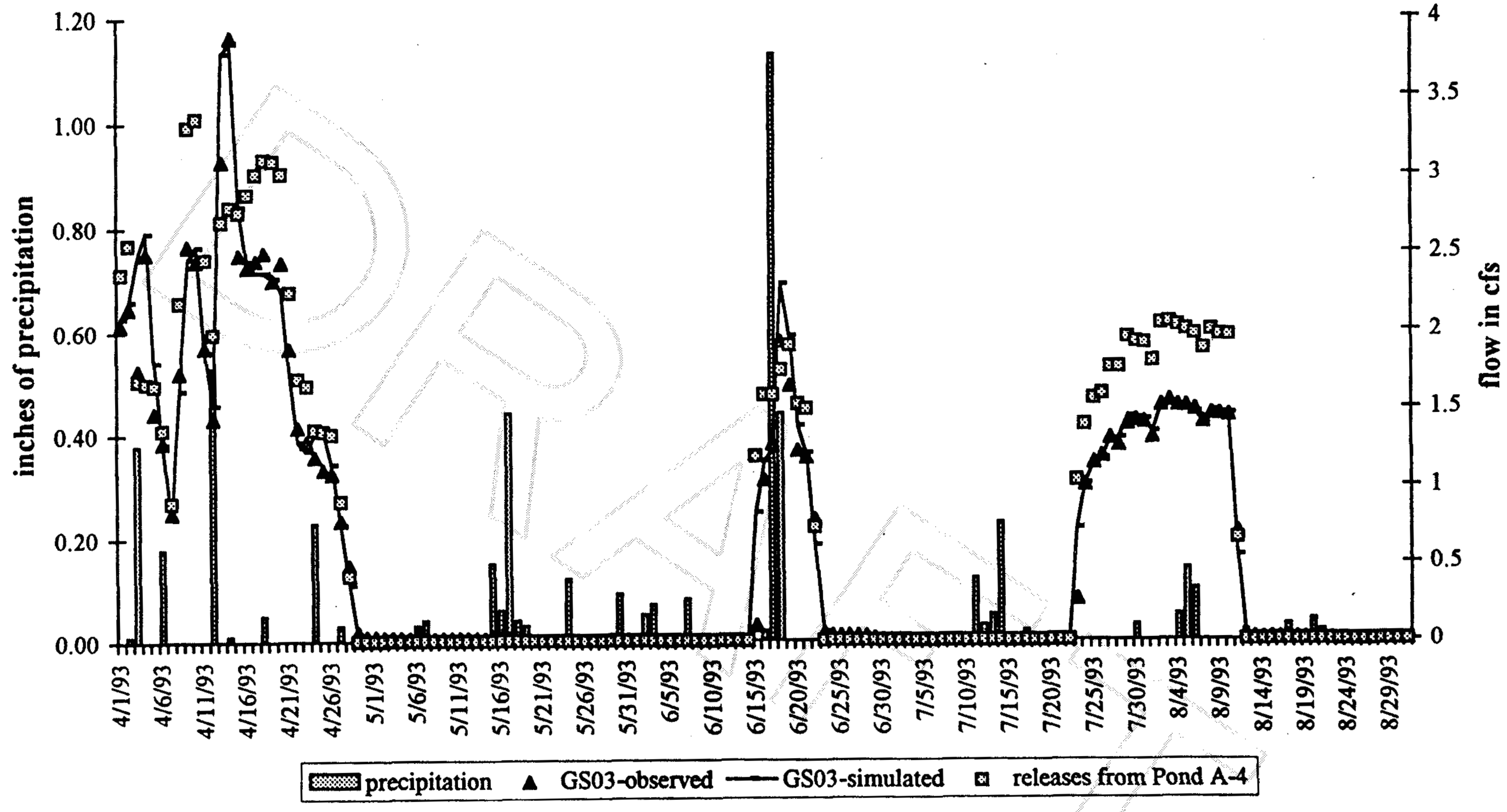
SCHEMATIC REPRESENTATION OF THE HSPF ELEMENTS IN THE OU-6 SURFACE WATER MODEL

FIGURE H3-1

JUNE 1995

OU6RI314



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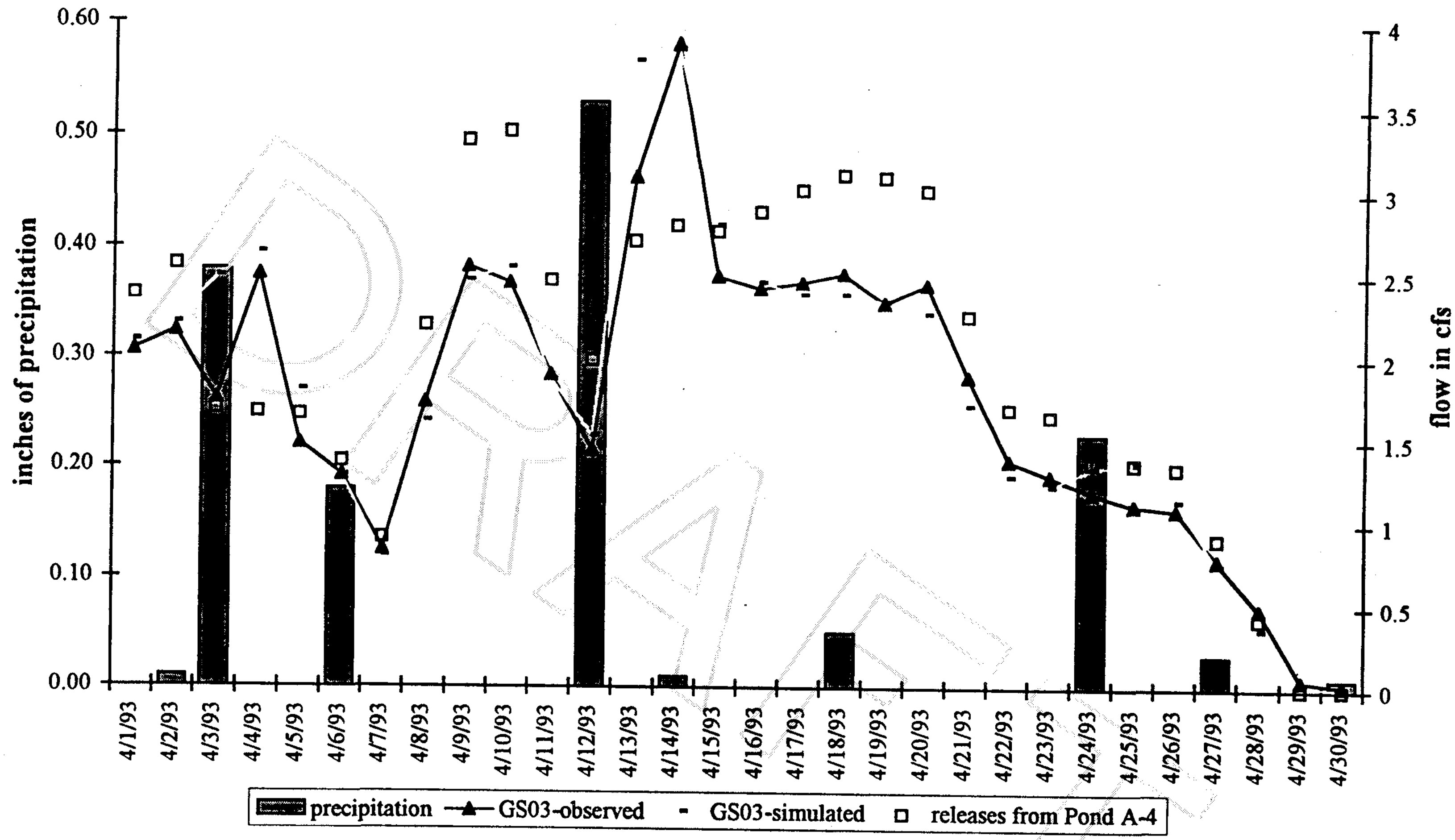
GS03 FLOWS
SIMULATED AND OBSERVED

FIGURE H4-1

JUNE 1995

OU6RI315



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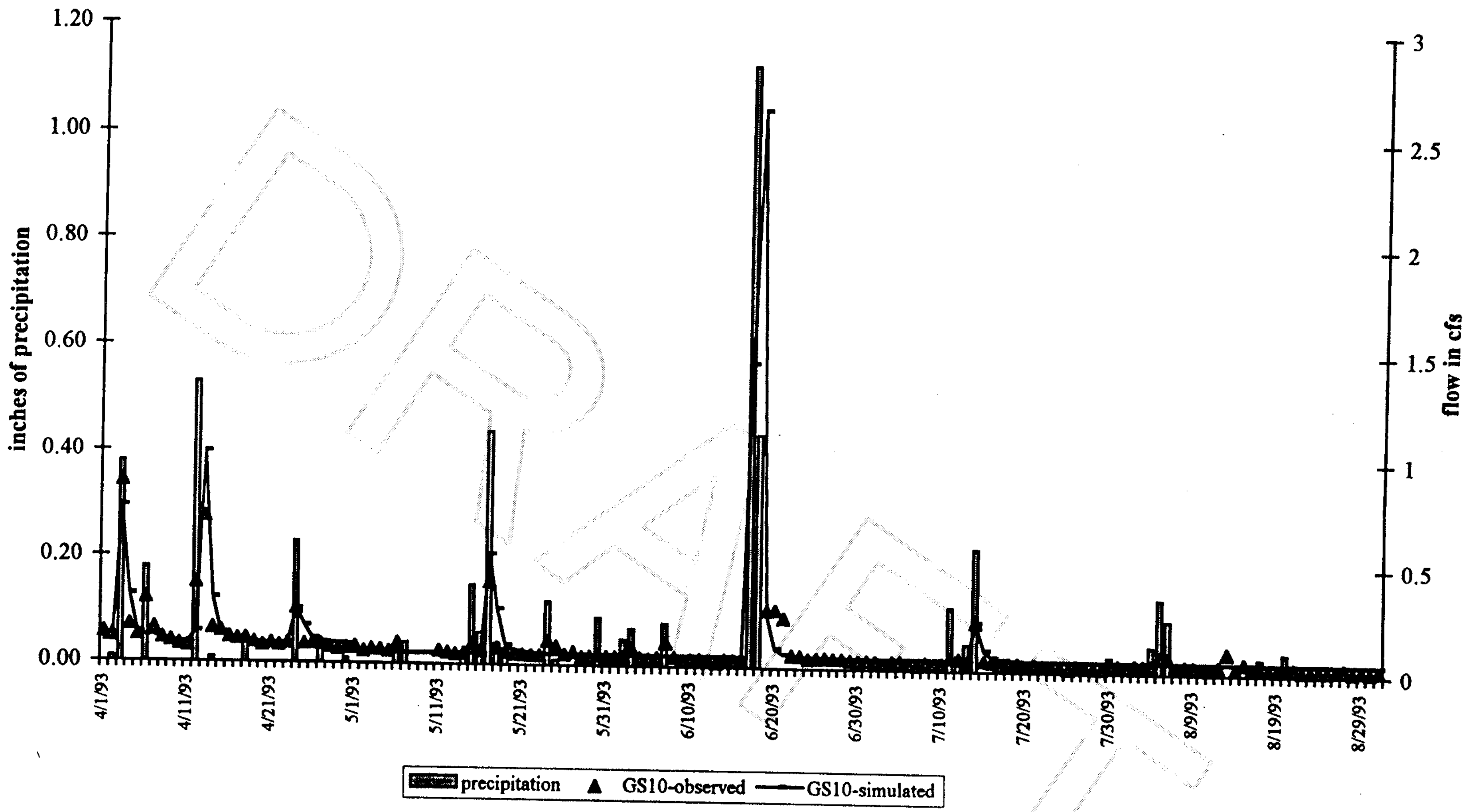
GS03 FLOWS IN APRIL
SIMULATED AND OBSERVED

FIGURE H4-2

JUNE 1995

OU6RI316



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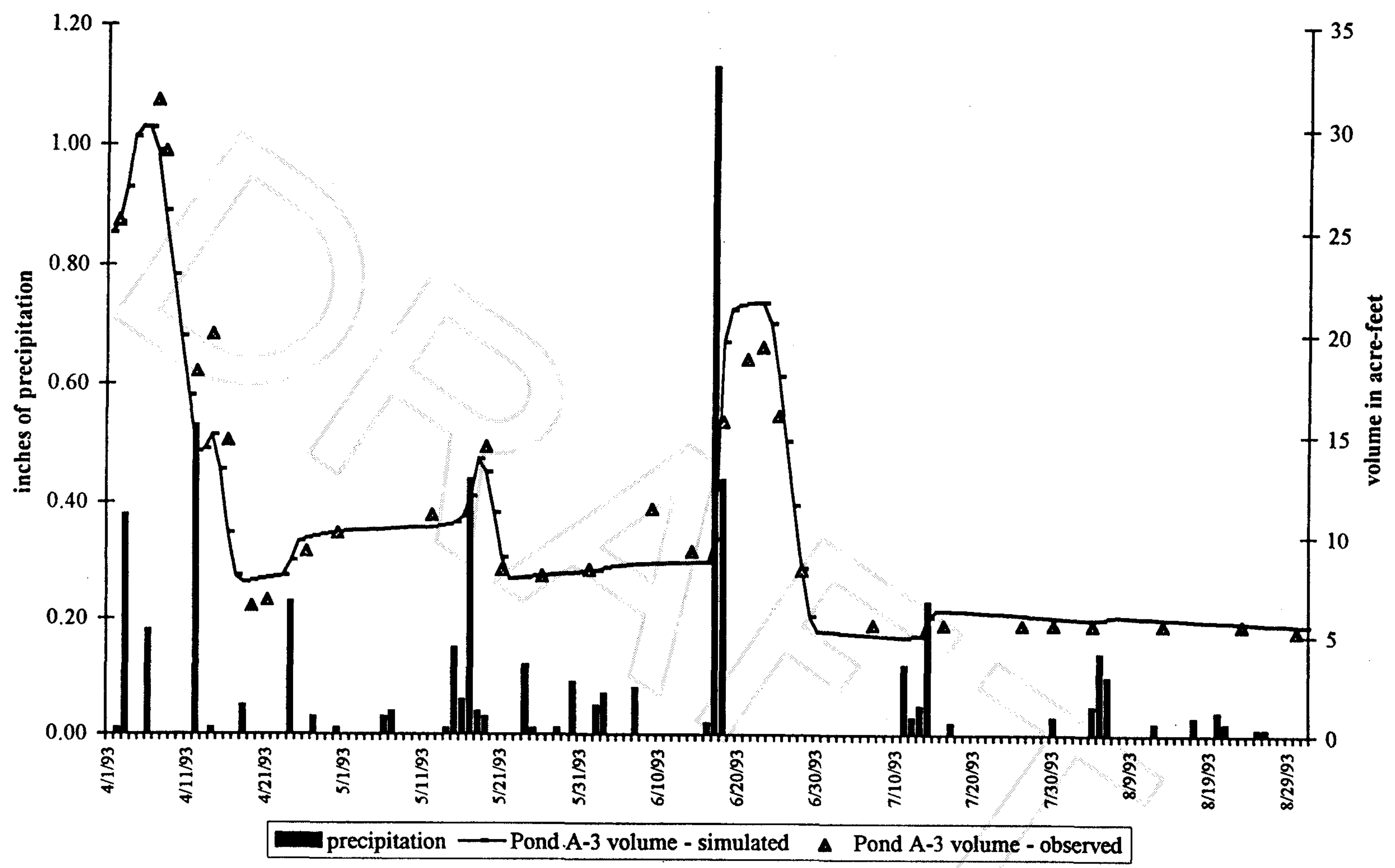
GS10 FLOWS
SIMULATED AND OBSERVED

FIGURE H4-3

JUNE 1995

OU6RI317



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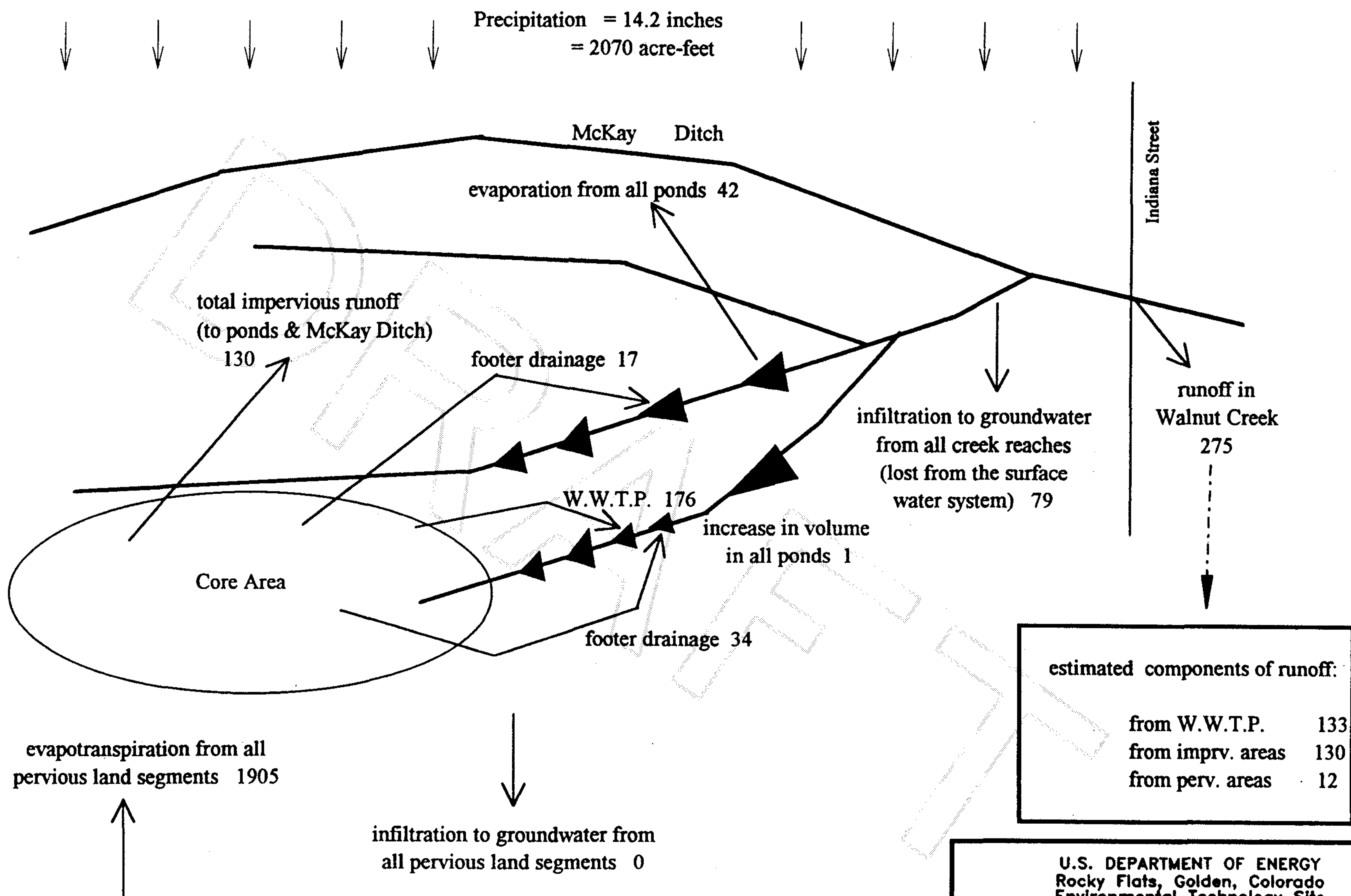
POND A-3 VOLUMES
SIMULATED AND OBSERVED

FIGURE H4-4

JUNE 1995

OU6RI318



NOTE:
ALL NUMBERS IN ACRE-FEET
UNLESS NOTED OTHERWISE

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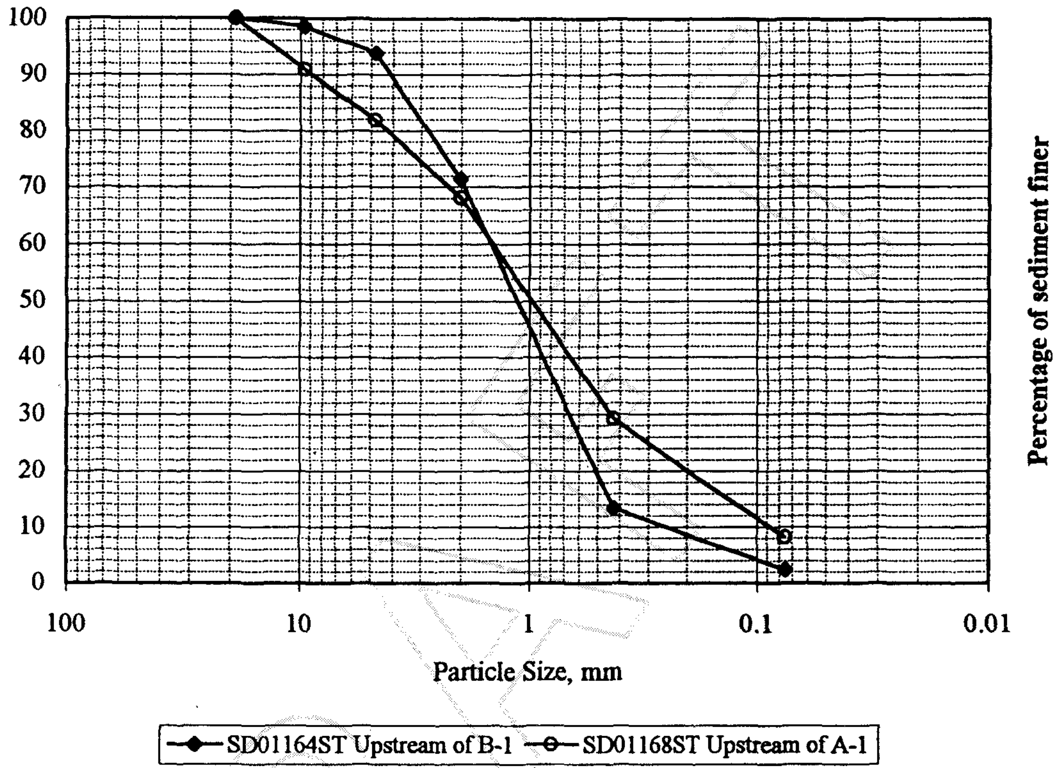
WATER BUDGET OF HSPF
SIMULATION RESULTS
ANNUAL AVERAGES OVER SIX YEARS

FIGURE H4-5

JUNE 1995

OU6RI319



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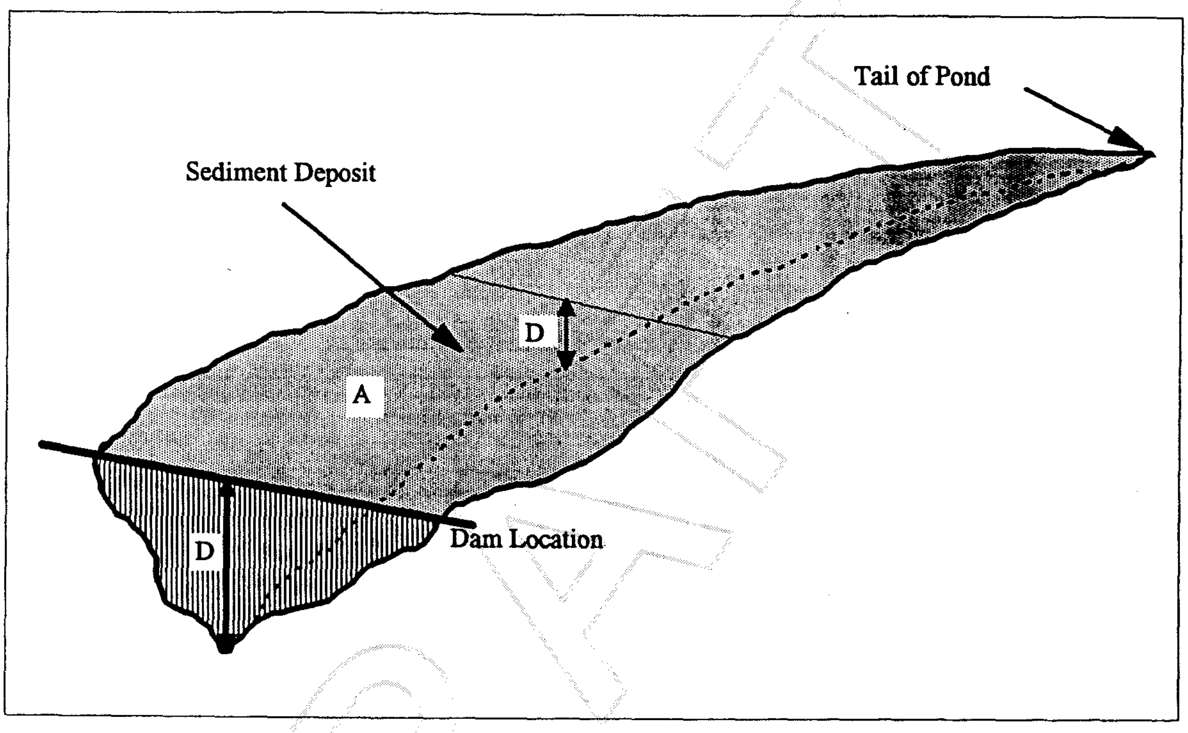
GRAIN SIZE DISTRIBUTIONS
OF STREAM/POND SEDIMENT

FIGURE H4-6

JUNE 1995

OU6RI320



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CONCEPTUAL SEDIMENT
DEPOSITION MODEL IN POND

FIGURE H4-8

JUNE 1995

OU6RI321

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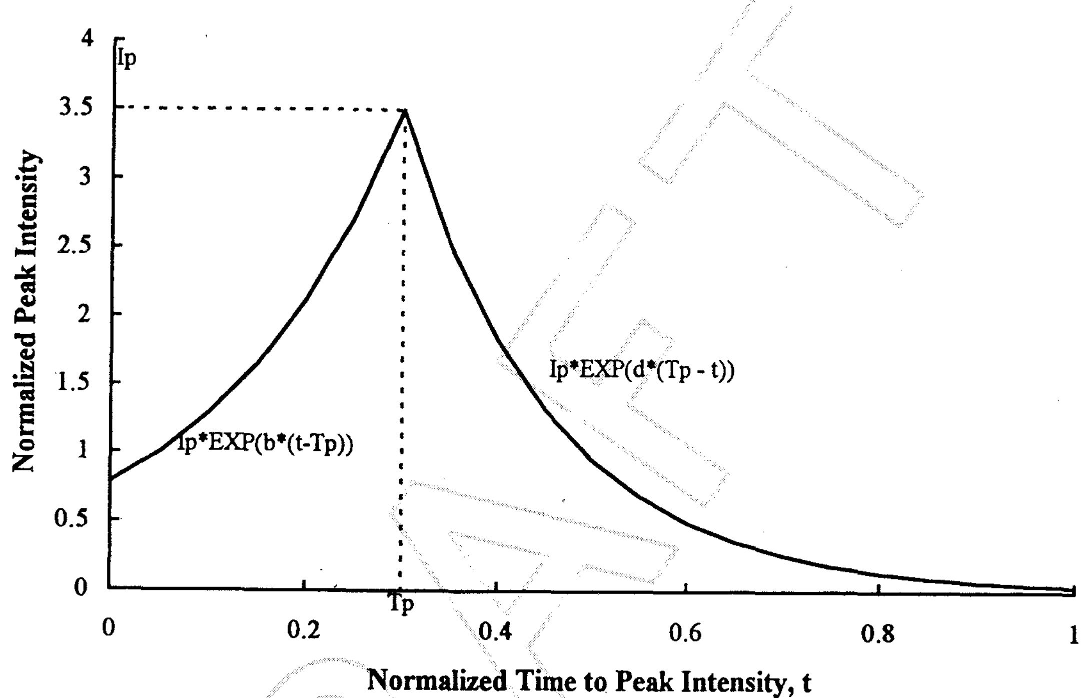

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HYPOTHETICAL HYETOGRAPH
FOR A SINGLE STORM EVENT

FIGURE H5-1

JUNE 1995

OU6RI322

Woodward-Clyde Federal Services

Memorandum

To: Neil Holsteen
EG&G

From: Chuan-Mian Zhang
Pat Westphal

Office: WCFS-Denver

Date: Oct. 7, 1994

Subject: Objectives for Surface Water Modeling
Rocky Flats RFI/RI Report, Operable Unit No. 6 (Walnut Creek Priority Drainage)

Within the last month, technical staff at Woodward-Clyde have conducted a preliminary evaluation of the surface water modeling for OU-6, focussing on the modeling objectives, source loads to the Walnut Creek drainage, the potential for contaminant migration, and the expected results of the modeling effort. The major objective of the surface water modeling for OU-6 is to assess contaminant fate and transport in support of human health and ecological risk assessment. For the human health risk assessment (HHRA), this entails predicting long-term average concentrations of contaminants in stream flow and in stream sediment at Indiana Street, the assumed exposure point for off-site receptors. At EG&G's direction, only contaminant sources within OU-6 are to be used as contaminant loads to the Walnut Creek drainage.

Our evaluation has led to the following conclusions:

(1) the worst-case condition for exposure to contaminants in the drainage is direct exposure to current contaminant concentrations in pond sediments;

(2) contaminant concentrations in pond sediment will not increase in the future from source loads in OU-6, which are insignificant compared to existing pond sediment concentrations;

(3) little potential exists for contaminanted pond sediment transport beyond the ponds themselves, even under flood conditions;

(4) health risks under the worst-case on-site exposure condition are not likely to exceed EPA levels of concern (cancer risk > 10^{-4}); therefore, estimates of exposure concentrations for other conditions may not be needed to support remediation decisions.

Although these conclusions could probably be supported without full scope work of surface water modeling using the Hydrogical Simulation Program - Fortran (HSPF) model, we propose to continue the modeling effort. The modeling will be used to validate these conclusions for purposes of the baseline HHRA for OU-6 and to demonstrate negligible incremental risk from exposure of off-site receptors to predicted long-term average concentrations in water and sediment at downgradient exposure points. We also acknowledge the merit of this model in serving other objectives than the baseline HHRA, such as providing stream segment data for ecological assessments, modeling contaminant loads from outside OU-6, and supporting evaluation of future use scenarios at Rocky Flats.

The rationale for our conclusions is described below.

(1) Current Condition Is Worst-Case
(2) Current Sediment Contaminant Levels Will Not Increase from OU-6 Sources

Concentrations of chemicals of concern (COCs) in OU-6 media were reviewed to identify source loads for the model. This review showed that contaminant concentrations were highest in the pond sediments themselves and that other potential sources of contaminant loadings to Walnut Creek in OU-6 (such as surface soil or groundwater) were insignificant in comparison. This is demonstrated using summary statistics for plutonium-239/240 (Pu) in various media as an example:

Summary Statistics for Plutonium in Various Media

Medium	No. of samples	Arithmetic mean (pC_i/g)	Standard deviation (pC_i/g)	Maximum (pC_i/g)	Percent of results > 3.42 pC_i/g*
Pond sediment	50 (A- and B-series ponds)	16.25	32.80	180.2	46%
Stream sediment	15	0.29	0.51	1.95	0%
Surface soil	118	0.994	1.949	15.22	5%
Pond water (unfiltered)	51 (A- and B-series ponds)	0.015 (pC_i/l)	0.019(pC_i/l)	0.076(pC_i/l)	NA

* Risk-based screening level for plutonium-239/240 in soil, assuming residential use, is 3.42 pC_i/g (DOE 1994).

Review of the summary statistics shows that average Pu activities are one to two orders of magnitude higher in pond sediments than in stream sediment or surface soil in OU-6. This difference is typical of the concentrations of COCs in the various media. The data support the conclusion that surface soil in OU-6 is not a likely source of radionuclides in pond sediment. If only sources in OU-6 are considered, the future activities of Pu in pond sediment can be expected to decrease rather than increase because overland flow will carry relatively clean soil into the ponds. Therefore, transport of contaminants presently in pond sediments is the chief concern for predicting future conditions.

Consequently, our preliminary evaluation turned to the assessment of (1) the potential for significant sediment transport to downstream exposure points and (2) for health risk to exceed a level of concern at downstream exposure points.

(3) Minimal Potential for Sediment Transport

A screening-level evaluation of the potential for sediment transport off-site was conducted. The B-series ponds (B1 through B-5) were selected for the evaluation because of the high radionuclide activities in sediments in ponds B-1 through B-4. The bed shear stress at the selected cross-sections along the B-series ponds under a 100-year flood event was estimated and compared to the critical shear stress for sediment suspension to determine if the pond sediment could be resuspended and transported out of the ponds. Two scenarios with varying flood hydrographs (2-hour duration and 24-hour duration) were examined under the assumption that the ponds were full ~~before peak flow coming.~~ at peak flow.

The results of tests indicate if the peak occurs at the later stage when ponds are filled up, except for Pond B-4, the bed shear stress during a 100-year flood event will not exceed the critical shear stress for suspension for consolidated silt and clay, which is assumed to represent the condition of the pond sediment (a common assumption for lake sediment; however, this parameter should be measured in the field before any decision is made). This means under such conditions, no pond sediment will be resuspended, except for Pond B-4. The suspended sediment from Pond B-4 may flow into Pond B-5. However, because of the sufficient capacity of B-5 the majority of sediment will resettle in Pond B-5. The very fine material of the suspended sediment from Pond B-4 may be carried out through the spillway of Pond B-5.

This test case is based on a very conservative assumption. Usually, under normal initial conditions (pond water is at 10-25% of capacity), 100-year flood may suspend pond sediment but may not carry the sediment out of the pond series. The volume of runoff in the South Walnut Creek watershed during a 100-year flood event was estimated to be 72 ac-ft by using the Colorado Urban Hydrograph Procedure model (Wright McLaughlin Engineers 1969; and UDFCD 1989). The pond capacity of B-5 alone is 74 ac-ft. If the peak of 100-year flood occurs at the early stage of the flood, it may have potential to scour the pond sediment. However the suspended sediment may not be discharged out of Pond B-5 because it has sufficient ~~capacity~~ to store the flood volume, and detention time is sufficient for suspended sediment to resettle. During the later stage of the flood, outflow over spillway may occur. While the outflow rate could be much smaller than the peak inflow rate, the flow velocity in the pond could be low and the associated shear stress could be smaller than the critical shear stress for sediment deposition. Therefore sediment may not be transported with the outflowing water.

(4) Health Risk from Direct Contact May Be Below Level of Concern

Current contaminant concentrations in pond sediment appear to represent the worst-case condition for assessing health risk from exposure to sediment since, over time, concentrations are expected to decrease rather than increase (see 1 and 2 above). A preliminary risk assessment was performed for direct contact with sediment in Ponds B-1 through B-4, which contain the highest contaminant concentrations in the A- and B-series ponds. The assessment evaluated ingestion and inhalation of Pu, americium-241, uranium-235, aroclor-1254, carcinogenic polycyclic aromatic hydrocarbons, and bis(2-ethylhexyl)phthalate, using 95% upper confidence level estimates of mean concentrations in the top 2-foot composite samples and assuming residential exposure to exposed sediments. This is an extremely conservative exposure scenario that will overestimate probable risk by approximately two orders of magnitude, since actual exposure to submerged sediment in ponds is likely to be intermittent and short-term. The estimated cancer risk under the residential scenario was 8×10^{-5}, which is below the level of 10^{-4} that usually determines whether remediation is required at Superfund sites (provided noncarcinogenic effects and ecological effects are not a concern). Considering that actual risk under a more reasonable exposure scenario, such as intermittent recreational use or exposure during ecological field studies, is likely to be about two orders of magnitude lower, direct exposure to contaminated pond sediment on-site is not likely to contribute significantly to overall risk, and risk would be negligible for off-site receptors, given the improbability of off-site transport of pond sediment.

CONCLUSIONS

In summary, our preliminary investigations under the OU-6 surface water modeling task suggest that there is little likelihood of contaminated soils or sediments in OU-6 presenting a significant human health risk through surface water transport. This is essentially because (a) risk from direct exposure to submerged pond sediment under probable exposure conditions are likely to be relatively insignificant and contaminant concentrations will not increase in the future based on OU-6 sources, and (b) even if the pond sediments present a significant risk, the potential for sediment to be transported downstream is minium at flood frequencies of 100 years or less. With regard to continuing the OU-6 surface water modeling task given these insights, we propose to continue that effort under the assumption that it is beneficial to validat these conclusions and that other objectives, such as evluating futuer use scenarios or other loading to the watershed, can aslo be supported by the model.

References

U.S. Department of Energy (DOE). 1994. Programmatice Preliminary Remediation Goals. Rocky Flates Plant, Golden, Colorado.

Woodward-Clyde Federal Services

Memorandum

Urban Drainage and Flood Control District, Denver, Colorado. 1989. CUHPE-PC, A Personal Computer Digital Model for Storm Hyetograph and Hydrograph Prediction.

Wright-McLaughlin Engineers. 1969. Urban Strom Drainage Criteria Manual, Volume I.

cc: Bob Clark, WCFS
Mary Lee Hogg, EG&G
Andis Berzins, EG&G
Kate Power, WCFS
Pat Westphal, WCFS
Frank Lan, WCC
Rob Zuber, WCC
Keith Little

DRAFT

```
RUN

GLOBAL
Version  10 run:  DRAINAGE TO WALNUT CREEK AT INDIANA AVE. (GS03)
******* includes Core Area and A- and B- series ponds
******* includes f-tables based on July 18, 1994 field notes  ****
******* includes (most) params. from 9/19/94 optimization

START       1986/04/01 00:00  END    1993/03/31 00:00
RUN INTERP OUTPUT LEVEL    3
RESUME     0 RUN     1 TSSFL    15 WDMSFL   16
END GLOBAL

FILES
<FILE> <UN#>***<----FILE NAME------------------------------------------------->
WDM       16    THE-NEW.WDM
MESSU     01    walnut4.L01
40     walnut4.S40
41     walnut4.S41
42     walnut4.S42
71     GSST-03.001
72     GSST-03.002
73     POND-A1.001
74     POND-A1.002
75     POND-A2.001
76     POND-A2.002
77     POND-A3.001
78     POND-A3.002
79     POND-A4.001
80     POND-A4.002
81     POND-B1.001
82     POND-B1.002
83     POND-B2.001
84     POND-B2.002
85     POND-B3.001
86     POND-B3.002
87     POND-B4.001
88     POND-B4.002
89     POND-B5.001
90     POND-B5.002
91     VOL-7Y.DAT
INFO      14    HSPINF.DA
ERROR     03    HSPERR.DA
WARN      04    HSPWRN.DA
END FILES


OPN SEQUENCE
INGRP              INDELT 01:00
PERLND       1
RCHRES       1
PERLND       2
IMPLND       1
RCHRES       2
RCHRES       3
PERLND       4
RCHRES       5
```

DRAFT

```
***start core area and ponds***
PERLND       7
IMPLND       2
RCHRES       8
PERLND       8
IMPLND       3
RCHRES       9
PERLND      19
RCHRES      25
PERLND      20
RCHRES      26
PERLND       9
RCHRES      10
RCHRES      11
PERLND      21
RCHRES      27
PERLND      10
**** added B1 and B2 on 10-4-94  ********
PERLND      15
RCHRES      21
PERLND      16
RCHRES      22
PERLND      11
RCHRES      14
RCHRES      15
PERLND      12
IMPLND       4
PERLND      14
RCHRES      20
RCHRES      19
RCHRES      16
RCHRES      17
PERLND      17
PERLND      18
RCHRES      24
RCHRES      23
PERLND      13
RCHRES      18
RCHRES      12
RCHRES      13
******  end core area and ponds *****
PERLND       3
RCHRES       4
PERLND       5
RCHRES       6
PERLND       6
RCHRES       7
PLTGEN       1
PLTGEN       2
PLTGEN       3
PLTGEN       4
PLTGEN       5
PLTGEN       6
PLTGEN       7
PLTGEN       8
PLTGEN       9
PLTGEN      10
PLTGEN      11
```

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```
PLTGEN       12
PLTGEN       13
PLTGEN       14
PLTGEN       15
PLTGEN       16
PLTGEN       17
PLTGEN       18
PLTGEN       19
PLTGEN       20
PLTGEN       21
END INGRP
END OPN SEQUENCE

***{{{{{{{{{{{{{{{{{{{{{{{{{{{{{{   PERLND   }}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}***

PERLND
ACTIVITY
<PLS >          Active Sections (1=Active; 0=Inactive)             ***
# -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
1   21    1    1    1    1              1
END ACTIVITY

PRINT-INFO
<PLS > Print-flags: 2-PIVL,3-daily,4-monthly,5-yearly,6-never  *** PIVL  PYR
# -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC        ***
1   21    6    6    6    5              5                          24   12
END PRINT-INFO

GEN-INFO
*** Basin is not subdivided into multiple blocks (NBLKS=1);
*** All input units in English (1); print output to Fortran Unit 40
<PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
# -  #                          User  t-series Engl Metr ***
1   21 Basins all the same     1     1    1    1   40    0
END GEN-INFO

*** ---------- Section ATEMP ---------- ***

*** ATEMP section used, air temperature is  corrected for
*** different elevation.
ATEMP-DAT
<PLS >  Elevation diff. between MetSta and Woman Creek***
# -  #      Feet                                      ***
1   21    -400.
END ATEMP-DAT
*** ------- End ATEMP, Start SNOW --------- ***

ICE-FLAG
<PLS >  0= Ice formation not simulated; 1= Simulated ***
# -  #ICEFG                                         ***
1   21    1
END ICE-FLAG

SNOW-PARM1
*** LAT is latitude of basin, Latitude = 39 53';
*** MELEV is mean elevation of basin, mean elev = (6050+5620)/2;
*** SHADE is percent basin shaded by tress, etc (0.0/0.0/1.0);
*** SNOWCF is factor to increase precip value if snowing due to under-reading
```

```
*** of precipitation during snow conditions (none/1.0/100.0); per Brent Bowen.
*** COVIND is the maximum pack (in. water eq) required to obtain complete
*** areal coverage. (none/0.01/none) compare to COVINX in snow-init2.
*** COVIND is fixed. COVINX is varied by program
<PLS >  Snow input info: Part 1                              ***
# -  #        LAT     MELEV      SHADE    SNOWCF    COVIND ***
1   21      39.88     5835.       0.05      1.24      0.14
END SNOW-PARM1

SNOW-PARM2
*** RDCSN is snow density (new) relative to water (0.15/0.01/1.0);
*** TSNOW is temp at which precip is snow (32.0/30.0/40.0);
*** SNOEVP is parameter to adjust snow evap rate (0.1/0.0/1.0);
*** CCFACT is parameter to adjust snow condensation rate (1.0/0.0/2.0);
*** MWATER max water content % of snowpack, [water/water] (0.03/0.0/1.0);
*** MGMELT is max rate [in/day] of snowmelt by groundheat (0.01/0.0/1.0);
<PLS >  Snow input info: Part 2                                        ***
# -  #      RDCSN     TSNOW     SNOEVP    CCFACT    MWATER    MGMELT ***
1   21       0.10       33.       0.20       2.0      0.10    0.0100
END SNOW-PARM2

SNOW-INIT1
*** PACKSNOW is initial quantity of snow in pack [in. water] (0.0/0.0/none);
*** PACKICE is initial quantity of ice in pack [in. water] (0.0/0.0/none);
*** PACKWATER is init quantity of liquid water in snow pack [in.] (0.0/0.0/none);
*** RDENPF is density of frozen contents(snow+ice) to water (0.2/0.01/1.0);
*** DULL is index to dullness (albedo estimation) (400.0/0.0/800.0);
*** PAKTMP is mean temp of frozen portion of snow pack (32.0/none/32.0);
<PLS >  Initial snow conditions: Part 1                                ***
# -  #  PACKSNOW   PACKICE PACKWATER    RDENPF      DULL    PAKTMP ***
1   21       0.2       .05       0.0       0.2      400.      30.0
END SNOW-INIT1

SNOW-INIT2
*** COVINX is the index (in. water eq.) to areal coverage. value is
*** between 1/10 and 1.0 of COVIND, equal to packf (0.01/0.01/none);
*** XLNMLT current remaing possible increment to ice storage in the pack (0.0/0.0/none);
*** SKYCLR is fraction of sky clear at present time
<PLS >  Initial snow conditions: Part 2 ***
# -  #    COVINX    XLNMLT    SKYCLR    ***
1   21     0.014       0.0       1.0
END SNOW-INIT2

*** ------ End SNOW, Start PWATER ------ ***

PWAT-PARM1
*** CSNO 0-snow not implemented, 1-snow implemented;
*** RTOP 0-new overland flow routing algorithm used, 1-standard ARM,
*** HSPX, and NPS algorithm used;
*** UZFG 0-new inflow to upper zone algorithm used, 1-standard ARM,
*** HSPX, and NPS algorithm used;
*** V??, 1 indicates to vary the 6 parameters during the year, 0
*** means that they are fixed (VCS-inter. storage, VUZ-upper zone storage,
*** VNN-Manning's n, VIFW-interflow inflow parameter, VIRC-interflow recession
*** parameter, VLE-lower zone ET parameter);
<PLS >  PWATER variable monthly parameter value flags ***
# -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE    ***
1   21    1    0    0    1    1    0    0    0    1
```

```
END PWAT-PARM1

PWAT-PARM2
*** FOREST fraction of land which transpires during winter (0.0/0.0/1.0);
*** LZSN lower zone nominal storage [in.] (none/0.01/100.0);
*** INFILT is index to infiltration capacity of the soil [in./hr] (none/0.0001/100.0);
*** LSUR is length of overland flow plane [ft] (none/1.0/none)
*** SLSUR is slope of overland flow plane  (none/0.000001/10.0);
*** KVARY parameter enabling groundwater recession flow to be non
*** exponential in decay with time (0.0/0.0/none);
*** AGWRC groundwater recession rate if KVARY = 0.0
*** [rate today/rate yesterday] (none/0.001/1.0);
<PLS >      PWATER input info: Part 2 ***
# -   # ***FOREST        LZSN    INFILT       LSUR     SLSUR      KVARY      AGWRC
1           0.000         5.0     0.050       350.     0.0500       0.0      0.422
2           0.000         5.0     0.050       350.     0.0200       0.0      0.422
3           0.000         5.0     0.050       300.     0.1000       0.0      0.422
4           0.000         5.0     0.050       300.     0.0700       0.0      0.422
5           0.000         5.0     0.050       300.     0.1000       0.0      0.422
6           0.000         5.0     0.050       300.     0.1000       0.0      0.422
7           0.000         5.0     0.050       350.     0.0300       0.0      0.422
8           0.000         5.0     0.050       350.     0.0300       0.0      0.422
9           0.000         5.0     0.050       250.     0.2000       0.0      0.422
10          0.000         5.0     0.050       250.     0.1500       0.0      0.422
11          0.000         5.0     0.050       250.     0.1600       0.0      0.422
12          0.000         5.0     0.050       250.     0.1600       0.0      0.422
13          0.000         5.0     0.050       250.     0.1300       0.0      0.422
14          0.000         5.0     0.050       350.     0.0200       0.0      0.422
15          0.000         5.0     0.050       250.     0.12         0.0      0.422
16          0.000         5.0     0.050       250.     0.12         0.0      0.422
17          0.000         5.0     0.050       250.     0.16         0.0      0.422
18          0.000         5.0     0.050       350.     0.02         0.0      0.422
19          0.000         5.0     0.050       250.     0.12         0.0      0.422
20          0.000         5.0     0.050       250.     0.12         0.0      0.422
21          0.000         5.0     0.050       250.     0.16         0.0      0.422
END PWAT-PARM2

PWAT-PARM3
*** PETMAX is air temp below which ET is arbitrarily reduced from input TSS (40.0/none/none)
*** PETMIN is is temp below which ET is zero (35.0/none/none)
*** INFEXP is the exponent in the infiltration equation (p. 164) (2.0/0.0/10.0)
*** INFILD is the ratio between max and mean infiltration (2.0/1.0/2.0)
*** DEEPFR is fraction of groundwater inflow which will enter inactive
*** groundwater storage (0.0/0.0/1.0)
*** BASETP is the fraction of remaining potential ET which can be satisfied
*** from baseflow (0.0/0.0/1.0)
*** AGWETP is the fraction of remaining potential ET which can be satisfied
*** from active groundwater storage (0.0/0.0/1.0)
<PLS >      PWATER input info: Part 3 ***
# -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
1   21       43.0      39.0       2.0       2.0      0.00       0.0       0.0

END PWAT-PARM3

PWAT-PARM4
*** CEPSC is the interception storage capacity [in] (0.0/0.0/10.0)
*** UZSN is the upper zone nominal storage [in] (none/0.01/10.0)
*** NSUR is the Manning's n for the overland flow plane (0.1/0.001/1.0)
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*** INTFW is the interflow inflow parameter (p.164) (none/1.0e-30/none)
*** IRC is the interflow recession parameter (none/1.0e-30/none). under
*** zero inflow, this is the ratio of interflow outflow rate today/rate
*** yesterday (p. 170)
*** LZETP is the lower zone ET parameter (index to density of deep rooted
*** vegetation (0.0/0.0/1.0)
<PLS >      PWATER input info: Part 4                                  ***
# -  #      CEPSC      UZSN      NSUR      INTFW      IRC      LZETP ***
1   21       0.10      0.70      0.05        1.7      0.95      0.35
END PWAT-PARM4

MON-INTERCEP
CEPSC ADJUSTMENT FACTORS                                              ***
# -  # JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
1   21 .08  .13  .20  .21  .21  .60  .60  .50  .30  .15  .13  .13
END MON-INTERCEP

MON-UZSN
UZSN  ADJUSTMENT FACTORS                                              ***
# -  # JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
1   21 .40  .40  .60 0.80 0.80  0.9  0.9  0.8  .70  .60  .50  .35
END MON-UZSN

MON-LZETPARM
LZETP ADJUSTMENT FACTORS                                              ***
# -  # JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
1   21.05  .05  .05  .1   .10  .60  .6   .6   .4   .2   .1   .05
END MON-LZETPARM

PWAT-STATE1
*** CEPS is the interception storage [in.] (0.0/0.0/100.0)
*** SURS is the surface storage  [in.] (0.0/0.0/100.0)
*** UZS is the upper zone storage [in.] (0.001/0.001/100.0)
*** IFWS is the interflow storage [in.] (0.0/0.0/100.0)
*** LZS is the lower zone storage [in.] (0.001/0.001/100.0)
*** AGWS is the active groundwater storage  [in.] (0.0/0.0/100.0)
*** GWVS is the index to groundwater slope  [in.] (0.0/0.0/100.0)
<PLS > *** Initial conditions at start of simulation
# -  # ***  CEPS      SURS      UZS      IFWS      LZS      AGWS      GWVS
1   21      0.00      0.0      0.0       0.0      6.00     .010     0.023
END PWAT-STATE1

SED-PARM1
<PLS> ***
#  - #  CRV VSIV SDOP ***
1   21    1    0    0
END SED-PARM1

SED-PARM2
<PLS> ***
#  - #       SMPF      KRER      JRER      AFFIX      COVER      NVSI ***
1             1.0       0.5      1.70      0.01        0.5      0.00
2             1.0       0.5      1.70      0.01        0.5      0.00
3             1.0       0.5      1.70      0.01        0.5      0.00
4             1.0       0.5      1.70      0.01        0.5      0.00
5             1.0       0.5      1.70      0.01        0.5      0.00
6             1.0       0.5      1.70      0.01        0.5      0.00
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7              1.0        0.5       1.70       0.01        0.5        0.00
8              1.0        0.5       1.70       0.01        0.5        0.00
9              1.0        0.5       1.70       0.01        0.5        0.00
10             1.0        0.5       1.70       0.01        0.5        0.00
11             1.0        0.5       1.70       0.01        0.5        0.00
12             1.0        0.5       1.70       0.01        0.5        0.00
13             1.0        0.5       1.70       0.01        0.5        0.00
14             1.0        0.5       1.70       0.01        0.5        0.00
15             1.0        0.5       1.70       0.01        0.5        0.00
16             1.0        0.5       1.70       0.01        0.5        0.00
17             1.0        0.5       1.70       0.01        0.5        0.00
18             1.0        0.5       1.70       0.01        0.5        0.00
19             1.0        0.5       1.70       0.01        0.5        0.00
20             1.0        0.5       1.70       0.01        0.5        0.00
21             1.0        0.5       1.70       0.01        0.5        0.00
END SED-PARM2

SED-PARM3
<PLS> ***
#  - #       KSER      JSER      KGER      JGER ***
1             .08       1.5     1.100       1.8
2             .08       1.5     1.100       1.8
3             .08       1.5     1.100       1.8
4             .08       1.5     1.100       1.8
5             .08       1.5     1.100       1.8
6             .08       1.5     1.100       1.8
7             .08       1.5     1.100       1.8
8             .08       1.5     1.100       1.8
9             .08       1.5     1.100       1.8
10            .08       1.5     1.100       1.8
11            .08       1.5     1.100       1.8
12            .08       1.5     1.100       1.8
13            .08       1.5     1.100       1.8
14            .08       1.5     1.100       1.8
15            .08       1.5     1.100       1.8
16            .08       1.5     1.100       1.8
17            .08       1.5     1.100       1.8
18            .08       1.5     1.100       1.8
19            .08       1.5     1.100       1.8
20            .08       1.5     1.100       1.8
21            .08       1.5     1.100       1.8
END SED-PARM3

MON-COVER
<PLS>   MONTHLY VALUES FOR EROSIN RELATED COVER  ****
#    #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
1   21  .25  .25  .25  .50  .50  .50  .50  .50  .54  .45  .33  .10
END MON-COVER
***  Water Quality Section ***
NQUALS
<PLS> ***
#  - #NQUAL    ***
1   21    3
END NQUALS

***  THE FOLLOWING ARE FOR THE FIRST COC - AM  ***
QUAL-PROPS
<PLS> IDENTIFIER AND FLAGS  ***
```

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#  - #*** QUALID      QTID  QSD VPFW VPFS  QSO  VQO QIFW VIQC QAGW VAQC
1   21         AM     KPCI    1    0    0    0    0    0    0    0    0
END QUAL-PROPS

QUAL-INPUT
<PLS> STORAGE ON SURFACE AND NONSEASONAL PARAMETERS    ***
#  - #***  SQO   POTFW    POTFS  ACQOP  SQOLIM   WSQOP    IOQC    AQQC   ***
1            0    0.91     0.91     0       0       0       0       0
2            0     0.0      0.0     0       0       0       0       0
3            0     0.0      0.0     0       0       0       0       0
4            0     0.0      0.0     0       0       0       0       0
5            0     0.0      0.0     0       0       0       0       0
6            0     0.0      0.0     0       0       0       0       0
7            0     0.0      0.0     0       0       0       0       0
8            0  270.58   270.58     0       0       0       0       0
9            0   55.39    55.39     0       0       0       0       0
10           0   79.90    79.90     0       0       0       0       0
11           0   49.94    49.94     0       0       0       0       0
12           0   38.14    38.14     0       0       0       0       0
13           0    9.08     9.08     0       0       0       0       0
14           0    3.63     3.63     0       0       0       0       0
15           0   83.54    83.54     0       0       0       0       0
16           0     0.0      0.0     0       0       0       0       0
17           0     0.0      0.0     0       0       0       0       0
18           0     0.0      0.0     0       0       0       0       0
19           0   10.90    10.90     0       0       0       0       0
20           0    3.63     3.63     0       0       0       0       0
21           0     0.0     0.00     0       0       0       0       0
END QUAL-INPUT

***  THE FOLLOWING ARE FOR THE SECOND COC - PU  ***
QUAL-PROPS
<PLS> IDENTIFIER AND FLAGS  ***
#  - #*** QUALID      QTID  QSD VPFW VPFS  QSO  VQO QIFW VIQC QAGW VAQC
1   21         PU     KPCI    1    0    0    0    0    0    0    0    0
END QUAL-PROPS

QUAL-INPUT
<PLS> STORAGE ON SURFACE AND NONSEASONAL PARAMETERS    ***
#  - #***  SQO   POTFW    POTFS  ACQOP  SQOLIM   WSQOP    IOQC    AQQC   ***
1            0    1.81     1.81     0       0       0       0       0
2            0     0.0      0.0     0       0       0       0       0
3            0     0.0      0.0     0       0       0       0       0
4            0     0.0      0.0     0       0       0       0       0
5            0     0.0      0.0     0       0       0       0       0
6            0     0.0      0.0     0       0       0       0       0
7            0     0.0      0.0     0       0       0       0       0
8            0  523.01   523.01     0       0       0       0       0
9            0  127.12   127.12     0       0       0       0       0
10           0  308.12   308.12     0       0       0       0       0
11           0  104.42   104.42     0       0       0       0       0
12           0  227.91   227.91     0       0       0       0       0
13           0   20.88    20.88     0       0       0       0       0
14           0    7.26     7.26     0       0       0       0       0
15           0  100.79   100.79     0       0       0       0       0
16           0  135.29   135.29     0       0       0       0       0
17           0    9.08     9.08     0       0       0       0       0
18           0   85.35    85.35     0       0       0       0       0
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19            0  164.35    164.35      0       0       0       0       0
20            0  296.00    296.00      0       0       0       0       0
21            0     0.0      0.00      0       0       0       0       0
END QUAL-INPUT

***  THE FOLLOWING ARE FOR THE Third COC - Sb (Antimony) ***
QUAL-PROPS
<PLS> IDENTIFIER AND FLAGS  ***
#  - #*** QUALID      QTID  QSD VPFW VPFS  QSO  VQO QIFW VIQC QAGW VAQC
1   21        SB      GRAM    1    0    0    0    0    0    0    0    0
END QUAL-PROPS

QUAL-INPUT
<PLS> STORAGE ON SURFACE AND NONSEASONAL PARAMETERS      ***
#  - #***  SQO    POTFW     POTFS  ACQOP  SQOLIM   WSQOP    IOQC    AQQC  ***
1            0   0.175     0.175      0       0       0       0       0
2            0   0.000     0.000      0       0       0       0       0
3            0   0.001     0.001      0       0       0       0       0
4            0   0.000     0.000      0       0       0       0       0
5            0   0.000     0.000      0       0       0       0       0
6            0   0.000     0.000      0       0       0       0       0
7            0   0.001     0.001      0       0       0       0       0
8            0   3.600     3.600      0       0       0       0       0
9            0   1.380     1.380      0       0       0       0       0
10           0   1.541     1.541      0       0       0       0       0
11           0   1.049     1.049      0       0       0       0       0
12           0   1.764     1.764      0       0       0       0       0
13           0   0.601     0.601      0       0       0       0       0
14           0   0.174     0.174      0       0       0       0       0
15           0   2.973     2.973      0       0       0       0       0
16           0   2.145     2.145      0       0       0       0       0
17           0   0.087     0.087      0       0       0       0       0
18           0   0.000     0.000      0       0       0       0       0
19           0   3.670     3.670      0       0       0       0       0
20           0   1.449     1.449      0       0       0       0       0
21           0   0.000     0.000      0       0       0       0       0
END QUAL-INPUT

END PERLND


*** {{{{{{{{{{{{{{{{{{{{{{{{{{{{{ IMPLND  }}}}}}}}}}}}}}}}}}}}}}}}}}}}} ***
IMPLND
ACTIVITY
<ILS >  Active Sections               ***
# -  # ATMP SNOW IWAT  SLD  IWG IQAL ***
1    4    1    1    1    1         1
END ACTIVITY

PRINT-INFO
<ILS >  Print-flags                         ***
# -  # ATMP SNOW IWAT  SLD  IWG IQAL PIVL  PYR ***
1    4    5    5    5    5         5        12
END PRINT-INFO

GEN-INFO
<ILS ><--------Name-------->  Unit-systems   Printer ***
# -  #                      User  t-series Engl Metr ***
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in  out          ***
1    4                    1     1     1   41     0
END GEN-INFO

*** ---------- Section ATEMP ---------- ***

*** ATEMP section used, air temperature is  corrected for
*** different elevation.
ATEMP-DAT
<PLS >  Elevation diff. between MetSta and Woman Creek***
# -  #     Feet                                    ***
1    4    -400.
END ATEMP-DAT
*** ------- End ATEMP, Start SNOW --------- ***

*** Section SNOW ***

ICE-FLAG
<ILS >  0= Ice formation not simulated, 1= Simulated ***
# -  #ICEFG                                      ***
1    4    1
END ICE-FLAG

SNOW-PARM1
<ILS >  Snow input info: Part 1                       ***
# -  #        LAT     MELEV     SHADE    SNOWCF    COVIND ***
1    4      39.88     5835.       .05      1.24      0.14
END SNOW-PARM1

SNOW-PARM2
<ILS >  Snow input info: Part 2                                     ***
# -  #      RDCSN     TSNOW    SNOEVP    CCFACT    MWATER    MGMELT ***
1    4       0.10       33.      0.20       2.0      0.10    0.0100
END SNOW-PARM2

SNOW-INIT1
<ILS >  Initial snow conditions: Part 1                             ***
# -  #  PACKSNOW   PACKICE PACKWATER    RDENPF      DULL    PAKTMP ***
1    4       0.1      0.05                 0.2      400.      30.0
END SNOW-INIT1

SNOW-INIT2
<ILS >  Initial snow conditions: Part 2 ***
# -  #    COVINX    XLNMLT    SKYCLR    ***
1    4      .014       0.0       1.0
END SNOW-INIT2

*** Section IWATER ***

IWAT-PARM1
<ILS >           Flags         ***
# -  # CSNO RTOP  VRS  VNN RTLI ***
1    4    1    0              1
END IWAT-PARM1

IWAT-PARM2
<ILS >                                         ***
# -  #       LSUR     SLSUR      NSUR     RETSC ***
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1            3300       .05        0.20      0.500
2            1000       .03        0.20      0.150
3             600       .03        0.20      0.150
4            3800       .017       0.20      0.150
END IWAT-PARM2

IWAT-PARM3
<ILS >                       ***
# -  #     PETMAX    PETMIN ***
1    4       43.        39.
END IWAT-PARM3

IWAT-STATE1
<ILS >  IWATER state variables ***
# -  #       RETS       SURS      ***
1    4       0.00        .00
END IWAT-STATE1

SLD-PARM1
<ILS >  SOLIDS PARAMETERS      ***
# -  # VASD VRDS SDOP           ***
1    4    0    1    0
END SLD-PARM1

SLD-PARM2
<ILS >    ***
# -  #        KEIM       JEIM     ACCSDP    REMSDP  ***
*** 1             0.20       1.70       0.01       0.2
*** 2             0.22       1.70      0.005       0.2
*** 3             0.95       1.70       0.01       0.2
*** 4             0.25       1.70       0.01       0.2
1            0.80       1.70       0.02       0.2
2            1.20       1.70       0.02       0.2
3            1.50       1.70       0.02       0.2
4            1.20       1.70       0.02       0.2
END SLD-PARM2

SLD-STOR
<ILS >  SOLIDS STORAGE   ***
# -  #                   ***
1    4        0.2
END SLD-STOR

NQUALS
<ILS> ***
#   - #NQUAL    ***
1     4    3
END NQUALS
*** FOR THE FIRST COC-AM ***
QUAL-PROPS
<ILS >  IDENTIFICATION AND FLAGS    ***
# -  #     QUALID      QTID  QSD VPFW  QSO  VQO  ***
1    4         AM      KPCI    1    0    0    0
END QUAL-PROPS

QUAL-INPUT
<ILS> STORAGE ON SURFACE AND NONSEASONAL PARAMETERS ***
#  - #      SQO    POTFW   ACQOP  SQOLIM   WSQOP        ***
```

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```
1              0    0.00        0         0         0
2              0    0.00        0         0         0
3              0  270.58        0         0         0
4              0    3.63        0         0         0
END QUAL-INPUT
*** FOR THE SECOND COC-PU ***
QUAL-PROPS
<ILS >  IDENTIFICATION AND FLAGS    ***
# -  #     QUALID       QTID  QSD VPFW  QSO  VQO  ***
1    4         PU       KPCI    1    0    0    0
END QUAL-PROPS

QUAL-INPUT
<ILS> STORAGE ON SURFACE AND NONSEASONAL PARAMETERS ***
#   - #      SQO    POTFW   ACQOP  SQOLIM    WSQOP       ***
1              0    0.00        0         0         0
2              0    0.00        0         0         0
3              0  523.01        0         0         0
4              0    7.26        0         0         0
END QUAL-INPUT

*** FOR THE THIRD COC-SB ***
QUAL-PROPS
<ILS >  IDENTIFICATION AND FLAGS    ***
# -  #     QUALID       QTID  QSD VPFW  QSO  VQO  ***
1    4         SB       GRAM    1    0    0    0
END QUAL-PROPS

QUAL-INPUT
<ILS> STORAGE ON SURFACE AND NONSEASONAL PARAMETERS ***
#   - #      SQO    POTFW   ACQOP  SQOLIM    WSQOP       ***
1              0   0.000        0         0         0
2              0   0.001        0         0         0
3              0   3.600        0         0         0
4              0   0.174        0         0         0
END QUAL-INPUT

END IMPLND


*********{{{{{{{{{{{{{{*******RCHRES*******************}}}}}}}}}
RCHRES
ACTIVITY
RCHRES  Active Sections (1=Active, 0=Inactive)          ***
# -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
1   27    1    1    0    1    1    1    0    0    0    0

END ACTIVITY

PRINT-INFO
RCHRES  Print-flags                                          ***
# -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR ***
1   27    5    6    6    6    5    5    6    6    6    6         12
END PRINT-INFO

GEN-INFO
RCHRES<-------Name------->Nexit   Unit Systems   Printer        *****
# -  #                          User t-series  Engl Metr LKFG *****
```

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```
in  out                  *****
1     NO NAME                   2    1    1    1   42    0    0
2     MCKAY BYPASS              2    1    1    1   42    0    0
3     MCKAY BYPASS              2    1    1    1   42    0    0
4     RCH OUT OF A4             2    1    1    1   42    0    0
5     MCKAY DITCH               2    1    1    1   42    0    0
6     WALNUT CRK                2    1    1    1   42    0    0
7     WALNUT CRK                2    1    1    1   42    0    0
8                               2    1    1    1   42    0    0
9                               2    1    1    1   42    0    0
10                              1    1    1    1   42    0    1
11                              2    1    1    1   42    0    0
12                              1    1    1    1   42    0    1
13                              2    1    1    1   42    0    0
14                              2    1    1    1   42    0    1
15                              2    1    1    1   42    0    0
16                              2    1    1    1   42    0    1
17                              2    1    1    1   42    0    0
18                              1    1    1    1   42    0    1
19                              2    1    1    1   42    0    0
20                              3    1    1    1   42    0    0
21                              2    1    1    1   42    0    1
22                              2    1    1    1   42    0    1
23                              2    1    1    1   42    0    0
24                              2    1    1    1   42    0    0
25                              2    1    1    1   42    0    1
26                              2    1    1    1   42    0    1
27                              2    1    1    1   42    0    0
END GEN-INFO

*** Section HYDR ***

HYDR-PARM1
RCHRES  Flags for HYDR section                        ***
# -  #  VC A1 A2 A3  ODFVFG for each    ODGTFG for each *** FUNCT  for each
FG FG FG FG  possible   exit     possible   exit *** possible   exit
1  2  3  4  5        1  2  3  4  5 ***   1  2  3  4  5
1    9    0  1  1  1    4  5
10        0  1  1  1   -1
11        0  1  1  1    4  5
12        0  1  1  1   -1
13        0  1  1  1    4  5
14        0  1  1  1    4  5
15        0  1  1  1    4  5
16        0  1  1  1    4  5
17        0  1  1  1    4  5
18        0  1  1  1   -1
19        0  1  1  1    4  5
20        0  1  1  1    4  5  6
21        0  1  1  1    4  5
22        0  1  1  1    4  5
23        0  1  1  1    4  5
24        0  1  1  1    4  5
25        0  1  1  1    4  5
26        0  1  1  1    4  5
27        0  1  1  1    4  5
END HYDR-PARM1
```

```
HYDR-PARM2
RCHRES ***
# - #        FTBN      LEN     DELTH     STCOR        KS      DB50 ***
1               1     1.23      140.                  .5     0.045 0.045
2               2     1.44      140.                  .5     0.045 0.045
3               3     0.78      190.                  .5     0.079 0.079
4               4     0.28       30.                  .5     0.200 0.145
5               5     0.34       55.                  .5     0.079 0.079
6               6     0.25       20.                  .5     0.200 0.118
7               6     0.25       20.                  .5     0.200 0.079
8               8     0.50       60.                  .5     0.394 0.145
9               9     0.20      100.                  .5     0.315 0.145
10             10      0.15       2.                   .5     0.079 0.045
11             11      0.15      30.                   .5     0.500 0.145
12             12      0.12       3.                   .5     0.045 0.045
13             13      0.23      30.                   .5     0.145 0.145
14             14      0.05       1.                   .5     0.045 0.045
15             15      0.06      10.                   .5     0.200 0.145
16             16      0.03       1.                   .5     0.045 0.045
17             17      0.18      35.                   .5     0.285 0.145
18             18      0.13       3.                   .5     0.045 0.045
19             19      0.13      60.                   .5     0.500 0.145
20             20      0.5       60.                   .5     0.256 0.145
21             21      0.05       2.                   .5     0.045 0.045
22             22      0.10       2.                   .5     0.045 0.045
23             23      0.06       5.                   .5     0.165 0.145
24             24      0.66     160.                   .5     0.500 0.500
25             25      0.08       2.                   .5     0.045 0.045
26             26      0.09       2.                   .5     0.045 0.045
27             27      0.15       5.                   .5     0.315 0.145
END HYDR-PARM2

HYDR-INIT
RCHRES  Initial conditions for HYDR section    ***
# - #       VOL     Initial  value  of COLIND *** Initial  value  of OUTDGT
(ac-ft)     for  each  possible  exit *** for  each  possible  exit
EX1  EX2  EX3  EX4  EX5 ***   EX1  EX2  EX3  EX4  EX5
1    9      00.0
10            8.0
11           00.0
12           32.0
13           00.0
14            0.7
15           00.0
16            0.4
17           00.0
18           18.4
19           00.0
20            0.0
21            0.8
22            2.4
23            0.0
24            0.0
25            2.0
26            9.0
27            0.0
END HYDR-INIT
```

```
HEAT-PARM
RCHRES       ELEV     ELDAT    CFSAEX    KATRAD     KCOND      KEVAP  ***
# -  #         FT        FT                                            ***
1   27      5300.     -400.       0.6      6.25      6.12       2.24
END HEAT-PARM

HEAT-INIT
RCHRES         TW    AIRTMP          ***
# -  #       DEGF      DEGF          ***
1   27        50.       60.
END HEAT-INIT

ADCALC-DATA
RCHRES  DATA FOR SECTION ADCALC    ***
#  - #      CRRAT        VOL       ***
1   27        1.5
END ADCALC-DATA

SANDFG
RCHRES           ***
#  - # SDFG      ***
1   27    1
END SANDFG

SED-GENPARM
RCHRES    BEDRID    BEDWRN      POR ***
#  - #      (FT)      (FT)          ***
1   27        5.       20.      0.4
END SED-GENPARM

SAND-PM
RCHRES          D          W        RHO     KSAND    EXPSND ***
#  - #       (IN)   (IN/SEC)   (MG/CM3)                     ***
1           0.045       5.90       2.65      15.0       2.0
2           0.045       5.90       2.65      15.0       2.0
3           0.079      11.80       2.65      15.0       2.0
4           0.200      19.68       2.65      15.0       2.0
5           0.079      11.80       2.65      15.0       2.0
6           0.200      19.68       2.65      15.0       2.0
7           0.200      19.68       2.65      15.0       2.0
8           0.394      29.10       2.65      15.0       2.0
9           0.315      25.98       2.65      15.0       2.0
10            0.079      11.80       2.65      15.0       2.0
11            0.500      33.50       2.65      15.0       2.0
12            0.045       5.90       2.65      15.0       2.0
13            0.145      16.53       2.65      15.0       2.0
14            0.045       5.90       2.65      15.0       2.0
15            0.200      19.68       2.65      15.0       2.0
16            0.045       5.90       2.65      15.0       2.0
17            0.285      24.41       2.65      15.0       2.0
18            0.045       5.90       2.65      15.0       2.0
19            0.500      33.50       2.65      15.0       2.0
20            0.315      25.98       2.65      15.0       2.0
21            0.045       5.90       2.65      15.0       2.0
22            0.045       5.90       2.65      15.0       2.0
23            0.165      17.71       2.65      15.0       2.0
24            0.500      33.50       2.65      15.0       2.0
25            0.045       5.90       2.65      15.0       2.0
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26          0.045       5.90       2.65       15.0        2.0
27          0.315      25.98       2.65       15.0        2.0
END SAND-PM

SILT-CLAY-PM
RCHRES          D          W         RHO      TAUCD      TAUCS          M    ***
#  - #        (IN)   (IN/SEC)   (GM/CM3)   (LB/FT2)   (LB/FT2)   (LB/FT2.D)  ***
1          0.0008      0.015       2.65      0.050      0.075        0.05
2          0.0008      0.015       2.65      0.040      0.050        0.05
3   11     0.0008      0.015       2.65      0.050      0.075        0.05
12          0.0008      0.015       2.65      0.050      0.050        0.05
13   15     0.0008      0.015       2.65      0.050      0.050        0.05
16          0.0008      0.015       2.65      0.050      0.050        0.05
17   27     0.0008      0.015       2.65      0.050      0.075        0.05
END SILT-CLAY-PM

SSED-INIT
RCHRES     SUSPENDED SED. CONCS (MG/L)  ***
#  - #       SAND       SILT       CLAY    ***
1   27        20.         5.         5.
END SSED-INIT

BED-INIT
RCHRES    BEDDEP  INITIAL BED COMPOSITION       ***
#  - #      (FT)      SAND       SILT      CLAY  ***
1   22       5.0       0.9       0.05      0.05
23            5.0       0.9       0.05      0.05
24            0.1       0.9       0.05      0.05
25 - 27       5.0       0.9       0.05      0.05
END BED-INIT
***  WATER QUALITY - SEDIMENT ASSOCIATED ***
GQ-GENDATA
RCHRES      ***
#  - # NGQL TPFG PHFG ROFG CDFG SDFG PYFG  LAT   ***
1   27    3    1
END GQ-GENDATA

****  THE FOLLOWING ARE FOR THE FIRST CHEMICAL AM ****
GQ-QALDATA
RCHRES      ***
#  - #                 GQID      DQAL    CONCID     CONV     QTYID    ***
1   27                  AM        0.0       PCI    0.0353      PCI
END GQ-QALDATA

GQ-QALFG
RCHRES      ***
#  - # HDRL OXID PHOT VOLT BIOD  GEN SDAS    ***
1   27    0    0    0    0    0    0    1
END GQ-QALFG

GQ-FLG2
RCHRES      ***
#  - # HDRL OXID PHOT VOLT BIOD  GEN SBMS    ***
1   27
END GQ-FLG2

GQ-KD
RCHRES      ***
```

```
#  - #      ADPM1      ADPM2      ADPM3      ADPM4      ADPM5      ADPM6  ***
1   27   1.0E-10    1.0E-10    1.0E-10    1.0E-10    1.0E-10    1.0E-10
END GQ-KD

GQ-ADRATE
RCHRES      ***
#  - #      ADPM1      ADPM2      ADPM3      ADPM4      ADPM5      ADPM6  ***
1   27   0.00001    0.00001    0.00001    0.00001    0.00001    0.00001
END GQ-ADRATE

GQ-SEDCONC
RCHRES      ***
#  - #      SQAL1      SQAL2      SQAL3      SQAL4      SQAL5      SQAL6  ***
1    5   0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
6        0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
7        0.00004    0.00004    0.00004    0.00004    0.00004    0.00004
8        0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
9        0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
10         0.00041    0.00041    0.00041    0.00041    0.00041    0.00041
11         0.00019    0.00019    0.00019    0.00019    0.00019    0.00019
12         0.00007    0.00007    0.00007    0.00007    0.00007    0.00007
13         0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
14         0.02370    0.02370    0.02370    0.02370    0.02370    0.02370
15         0.00020    0.00020    0.00020    0.00020    0.00020    0.00020
16         0.00085    0.00085    0.00085    0.00085    0.00085    0.00085
17         0.00006    0.00006    0.00006    0.00006    0.00006    0.00006
18         0.00013    0.00013    0.00013    0.00013    0.00013    0.00013
19         0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
20         0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
21         0.10057    0.10057    0.10057    0.10057    0.10057    0.10057
22         0.01138    0.01138    0.01138    0.01138    0.01138    0.01138
23         0.00012    0.00012    0.00012    0.00012    0.00012    0.00012
24         0.00000    0.00000    0.00000    0.00000    0.00000    0.00000
25         0.00929    0.00929    0.00929    0.00929    0.00929    0.00929
26         0.00101    0.00101    0.00101    0.00101    0.00101    0.00101
27         0.00044    0.00044    0.00044    0.00044    0.00044    0.00044
END GQ-SEDCONC

****  THE FOLLOWING ARE FOR THE SECOND CHEMICAL PU ****
GQ-QALDATA
RCHRES      ***
#  - #                   GQID       DQAL     CONCID       CONV      QTYID   ***
1   27                     PU        0.0        PCI     0.0353        PCI
END GQ-QALDATA

GQ-QALFG
RCHRES      ***
#  - # HDRL OXID PHOT VOLT BIOD  GEN SDAS    ***
1   27    0    0    0    0    0    0    1
END GQ-QALFG

GQ-FLG2
RCHRES      ***
#  - # HDRL OXID PHOT VOLT BIOD  GEN SBMS    ***
1   27
END GQ-FLG2

GQ-KD
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RCHRES      ***
#  - #     ADPM1     ADPM2     ADPM3     ADPM4     ADPM5     ADPM6   ***
1   27   1.0E-10   1.0E-10   1.0E-10   1.0E-10   1.0E-10   1.0E-10
END GQ-KD

GQ-ADRATE
RCHRES      ***
#  - #     ADPM1     ADPM2     ADPM3     ADPM4     ADPM5     ADPM6   ***
1   27   0.00001   0.00001   0.00001   0.00001   0.00001   0.00001
END GQ-ADRATE

GQ-SEDCONC
RCHRES      ***
#  - #     SQAL1     SQAL2     SQAL3     SQAL4     SQAL5     SQAL6   ***
1    5   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
6        0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
7        0.00008   0.00008   0.00008   0.00008   0.00008   0.00008
8        0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
9        0.00360   0.00360   0.00360   0.00360   0.00360   0.00360
10         0.00121   0.00121   0.00121   0.00121   0.00121   0.00121
11         0.01000   0.00100   0.00100   0.00100   0.00100   0.00100
12         0.00016   0.00016   0.00016   0.00016   0.00016   0.00016
13         0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
14         0.07889   0.07889   0.07889   0.07889   0.07889   0.07889
15         0.00161   0.00161   0.00161   0.00161   0.00161   0.00161
16         0.00261   0.00261   0.00261   0.00261   0.00261   0.00261
17         0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
18         0.00024   0.00024   0.00024   0.00024   0.00024   0.00024
19         0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
20         0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
21         0.02253   0.02253   0.02253   0.02253   0.02253   0.02253
22         0.02676   0.02676   0.02676   0.02676   0.02676   0.02676
23         0.00021   0.00021   0.00021   0.00021   0.00021   0.00021
24         0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
25         0.02900   0.02900   0.02900   0.02900   0.02900   0.02900
26         0.00319   0.00319   0.00319   0.00319   0.00319   0.00319
27         0.00137   0.00137   0.00137   0.00137   0.00137   0.00137
END GQ-SEDCONC

****  THE FOLLOWING ARE FOR THE THIRD CHEMICAL SB ****
GQ-QALDATA
RCHRES      ***
#  - #                GQID      DQAL    CONCID      CONV     QTYID    ***
1   27                  SB       0.0      GRAM    0.0353      GRAM
END GQ-QALDATA

GQ-QALFG
RCHRES      ***
#  - # HDRL OXID PHOT VOLT BIOD  GEN SDAS    ***
1   27    0    0    0    0    0    0    1
END GQ-QALFG

GQ-FLG2
RCHRES      ***
#  - # HDRL OXID PHOT VOLT BIOD  GEN SBMS    ***
1   27
END GQ-FLG2
```

```
GQ-KD
RCHRES      ***
#   - #      ADPM1     ADPM2     ADPM3     ADPM4     ADPM5     ADPM6   ***
1    27   1.0E-10   1.0E-10   1.0E-10   1.0E-10   1.0E-10   1.0E-10
END GQ-KD

GQ-ADRATE
RCHRES      ***
#   - #      ADPM1     ADPM2     ADPM3     ADPM4     ADPM5     ADPM6   ***
1    27   0.00001   0.00001   0.00001   0.00001   0.00001   0.00001
END GQ-ADRATE

GQ-SEDCONC
RCHRES      ***
#   - #      SQAL1     SQAL2     SQAL3     SQAL4     SQAL5     SQAL6   ***
1     6   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
7        0.000008  0.000008  0.000008  0.000008  0.000008  0.000008
8     9   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
10       0.000014  0.000014  0.000014  0.000014  0.000014  0.000014
11        0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
12       0.000029  0.000029  0.000029  0.000029  0.000029  0.000029
13        0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
14       0.000047  0.000047  0.000047  0.000047  0.000047  0.000047
15        0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
16       0.000017  0.000017  0.000017  0.000017  0.000017  0.000017
17        0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
18       0.000011  0.000011  0.000011  0.000011  0.000011  0.000011
19   20   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
21       0.000012  0.000012  0.000012  0.000012  0.000012  0.000012
22       0.000012  0.000012  0.000012  0.000012  0.000012  0.000012
23   24   0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
25       0.000021  0.000021  0.000021  0.000021  0.000021  0.000021
26       0.000012  0.000012  0.000012  0.000012  0.000012  0.000012
27        0.00000   0.00000   0.00000   0.00000   0.00000   0.00000
END GQ-SEDCONC


END RCHRES

******************************************************************************

FTABLES

FTABLE      1
ROWS COLS ***  NO NAME GULCH ***
20    5
****** volume <<< outlet dischg. means that after seepage
******  and evap.(HSPF calcultn.?), all remaining water in reach flows to
******  lower reach

surface             infilt.  dwnstrm.   ***
depth      area    volume    outlet    outlet     ***
dischg.   dischg.     ***
(ft)    (acres) (ac-ft)       (cfs)     (cfs)     ***
0.0      0.000     0.000     0.000     0.000
0.5      0.697     0.348     0.504     5.676
1.0      0.699     0.697     0.588    17.172
1.5      0.702     1.047     0.672    31.358
```

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2.0      0.704     1.399     0.756     47.213
2.3      0.933     1.644     0.904     54.879
2.6      1.162     1.958     1.051     66.458
3.0      1.467     2.484     1.248     88.269
4.0      2.231     4.333     1.739    179.593
5.0      2.994     6.945     2.230    334.999
6.0      3.757    10.321     2.722    568.752
7.0      4.520    14.459     3.213    894.274
8.0      5.283    19.361     3.704   1324.152
9.0      6.046    25.026     4.196   1870.278
10.0      6.810    31.454     4.687  2543.964
11.0      7.573    38.645     5.179  3356.040
12.0      8.336    46.599     5.670  4316.921
13.0      9.099    55.317     6.161  5436.670
14.0      9.862    64.798     6.653  6725.036
15.0     10.626    75.042     7.144  8191.489

END FTABLE  1

FTABLE      2
ROWS COLS ***   McKAY BYPASS ****
20    5
F-table for r2   ****

surface              infilt.  dwnstrm.   ****
depth      area     volume    outlet    outlet     ****
dischg.   dischg.      ****
(ft)    (acres) (ac-ft)/h     (cfs)      (cfs)       ****
0.0      0.000     0.000     0.000      0.000
0.5      2.919     1.384     1.794     11.832
1.0      3.221     2.919     2.006     41.893
1.5      3.524     4.606     2.217     85.592
2.0      3.826     6.443     2.428    142.195
2.3      4.007     7.618     2.554    182.279
2.6      4.188     8.847     2.681    226.972
3.0      4.430    10.571     2.850    293.803
4.0      5.035    15.303     3.272    497.998
5.0      5.639    20.640     3.694    757.515
6.0      6.243    26.581     4.117   1075.577
7.0      6.848    33.127     4.539   1455.583
8.0      7.452    40.277     4.961   1900.980
9.0      8.057    48.031     5.383   2415.207
10.0      8.661    56.390     5.806   3001.670
11.0     10.640    66.041     7.021   3440.401
12.0     12.619    77.670     8.237   4053.041
13.0     14.598    91.278     9.453   4839.687
14.0     16.577   106.866    10.668   5807.114
15.0     18.556   124.432    11.884   6965.210

END FTABLE  2

FTABLE      3
ROWS COLS ***  McKAY DITCH ***
20    5
F-table r3   ****

surface              infilt.  dwnstrm.   ****
depth      area     volume    outlet    outlet     ****
```

DRAFT

```
dischg.   dischg.     ****
 (ft)    (acres) (ac-ft)/h     (cfs)      (cfs)       ****
0.0       0.000     0.000    0.000      0.000
0.5       1.575     0.747    0.968     20.815
1.0       1.738     1.575    1.082     69.095
1.5       1.901     2.485    1.196    139.176
2.0       2.064     3.476    1.310    229.886
2.3       2.162     4.110    1.378    294.099
2.6       2.260     4.773    1.446    365.679
3.0       2.390     5.703    1.537    472.695
4.0       2.716     8.256    1.765    799.571
5.0       3.042    11.135    1.993   1214.884
6.0       3.368    14.340    2.221   1723.789
7.0       3.694    17.871    2.449   2331.718
8.0       4.020    21.728    2.676   3044.181
9.0       4.346    25.912    2.904   3866.677
10.0       4.672    30.421    3.132   4804.649
11.0       5.740    35.627    3.788   5507.297
12.0       6.808    41.901    4.444   6487.958
13.0       7.875    49.242    5.100   7746.786
14.0       8.943    57.651    5.755   9294.613
15.0      10.010    67.128    6.411  11147.246

END FTABLE   3

FTABLE       4
ROWS COLS ***          WALNUT CREEK ****
20    5
F-table R4    ****

surface              infilt.  dwnstrm. ****
depth       area    volume    outlet    outlet    ****
dischg.   dischg.     ****
(ft)    (acres) (ac-ft)/h     (cfs)      (cfs)        ****
0.0       0.000     0.000    0.000      0.000
0.5       0.104     0.052    0.083      3.219
1.0       0.105     0.104    0.104      8.975
1.5       0.199     0.180    0.165     16.497
2.0       0.294     0.303    0.226     32.029
2.3       0.350     0.400    0.263     46.036
2.6       0.407     0.513    0.299     64.120
3.0       0.483     0.691    0.348     95.341
4.0       0.672     1.269    0.470    215.062
5.0       0.861     2.036    0.591    405.761
6.0       1.051     2.992    0.713    680.653
7.0       1.240     4.137    0.835   1051.975
8.0       1.429     5.471    0.957   1531.221
9.0       1.618     6.995    1.079   2129.294
10.0       1.807     8.708    1.201   2856.616
11.0       1.997    10.610    1.322   3723.198
12.0       2.186    12.701    1.444   4738.703
13.0       2.375    14.982    1.566   5912.490
14.0       2.564    17.452    1.688   7253.643
15.0       2.754    20.111    1.810   8771.011

END FTABLE   4

FTABLE       5
```

DRAFT

ROWS COLS ***   McKAY DITCH (just upstrm. of Walnut Cr.)
20   5
F-table R5****

surface   infilt. dwnstrm.   ***
depth   area   volume   outlet   outlet   ***
dischg.   dischg.   ****

(ft)	(acres)	(ac-ft)/h	(cfs)	(cfs)	****
0.0	0.000	0.000	0.000	0.000	
0.5	0.606	0.245	0.369	11.687	
1.0	0.841	0.606	0.513	43.450	
1.5	1.075	1.085	0.657	97.720	
2.0	1.309	1.681	0.801	178.031	
2.3	1.450	2.095	0.887	240.164	
2.6	1.591	2.551	0.974	313.643	
3.0	1.778	3.225	1.089	430.483	
4.0	2.247	5.237	1.377	826.827	
5.0	2.715	7.718	1.665	1391.108	
6.0	3.184	10.668	1.953	2145.812	
7.0	3.653	14.086	2.241	3112.193	
8.0	4.121	17.974	2.529	4310.498	
9.0	4.590	22.329	2.816	5760.131	
10.0	5.059	27.154	3.104	7479.782	
11.0	5.528	32.447	3.392	9487.516	
12.0	5.996	38.209	3.680	11800.850	
13.0	6.465	44.440	3.968	14436.818	
14.0	6.934	51.139	4.256	17412.013	
15.0	7.402	58.307	4.544	20742.635	

END FTABLE 5

FTABLE   6
ROWS COLS ***   WALNUT CRK. (downstrm. of McKay Ditch) ****
20   5
F-table R6   ****

surface   infilt. dwnstrm.   ****
depth   area   volume   outlet   outlet   *****
dischg.   dischg.   ******

(ft)	(acres)	(ac-ft)	(cfs)	(cfs)	*****
0.0	0.000	0.000	0.000	0.000	
0.5	0.115	0.051	0.155	2.252	
1.0	0.140	0.115	0.203	7.568	
1.5	0.165	0.191	0.250	15.544	
2.0	0.190	0.279	0.297	26.292	
2.3	0.205	0.338	0.325	34.146	
2.6	0.220	0.402	0.353	43.109	
3.0	0.240	0.494	0.391	56.861	
4.0	0.290	0.759	0.485	100.907	
5.0	0.340	1.074	0.580	160.081	
6.0	0.390	1.439	0.674	235.979	
7.0	0.440	1.854	0.768	330.136	
8.0	0.490	2.319	0.863	444.033	
9.0	0.540	2.834	0.957	579.100	
10.0	0.879	3.544	1.373	660.340	
11.0	1.217	4.592	1.789	852.449	
12.0	1.556	5.978	2.205	1151.394	
13.0	1.894	7.703	2.620	1566.050	

DRAFT

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14.0     2.233     9.767     3.036  2108.942
15.0     2.571    12.169     3.452  2793.574

END FTABLE  6
*****no FTABLE 7 - reaches 6&7 both use FTABLE 6

FTABLE       8
ROWS COLS *****
20    5

F-table FOR R8                                        ****

surface             infilt.  dwnstrm.  ****
depth      area    volume    outlet    outlet   ****
dischg.   dischg.  ****
(ft)   (acres) (ac-ft)/h    (cfs)     (cfs)   ****
0.0     0.000     0.000    0.000     0.000
0.5     0.097     0.049    0.244     2.952
1.0     0.098     0.097    0.293     8.727
1.5     0.150     0.159    0.409    16.002
2.0     0.202     0.247    0.525    28.388
2.3     0.233     0.312    0.594    38.726
2.6     0.264     0.387    0.664    51.527
3.0     0.306     0.501    0.756    72.809
4.0     0.410     0.859    0.987   150.189
5.0     0.514     1.320    1.219   267.944
6.0     0.618     1.886    1.450   432.870
7.0     0.722     2.556    1.682   651.298
8.0     0.826     3.330    1.913   929.201
9.0     0.930     4.207    2.144  1272.262
10.0     1.034     5.189    2.376  1685.924
11.0     1.138     6.274    2.607  2175.425
12.0     1.242     7.464    2.838  2745.828
13.0     1.346     8.757    3.070  3402.041
14.0     1.450    10.155    3.301  4148.834
15.0     1.553    11.656    3.532  4990.856

END FTABLE  8

FTABLE       9
ROWS COLS *****
20    5
F-table FOR R9     ****

surface             infilt.  dwnstrm.****
depth      area    volume    outlet    outlet****
dischg.   dischg.****
(ft)   (acres) (ac-ft)/h    (cfs)     (cfs)****
0.0     0.000     0.000    0.000     0.000
0.5     0.097     0.049    0.073     7.074
1.0     0.098     0.097    0.088    20.081
1.5     0.150     0.159    0.123    36.572
2.0     0.202     0.247    0.157    64.494
2.3     0.233     0.312    0.178    87.745
2.6     0.264     0.387    0.199   116.502
3.0     0.306     0.501    0.227   164.270
4.0     0.410     0.859    0.296   337.744
5.0     0.514     1.320    0.366   601.500
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DRAFT

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6.0      0.618      1.886      0.435   970.733
7.0      0.722      2.556      0.504  1459.601
8.0      0.826      3.330      0.574  2081.460
9.0      0.930      4.207      0.643  2849.015
10.0      1.034      5.189      0.713  3774.439
11.0      1.138      6.274      0.782  4869.445
12.0      1.242      7.464      0.851  6145.353
13.0      1.346      8.757      0.921  7613.137
14.0      1.450     10.155      0.990  9283.467
15.0      1.553     11.656      1.060 11166.733

END FTABLE  9

FTABLE      10
ROW  COL ***   Pond A3
20    5
CLOSED        OPEN ***
DEPTH        AREA    VOLUME      DISCH      DISCH ***
(FT)         (AC)    (AC-FT)     (CFS)      (CFS) ***
0.0       0.000        0.0      0.00       0.00
1.0       0.047      0.020     0.000      0.500
4.0       0.758      1.290     0.000      0.500
5.0       0.985      2.180     0.000      0.500
7.0       1.504      4.650     0.000      0.500
7.2       1.540      4.900     0.000      2.000
8.0       1.763      6.260     0.000      2.000
9.0       2.072      8.200     0.000      2.000
11.0       2.638     12.910     0.000      2.000
14.0       3.423     21.940     0.000      2.000
15.0       3.696     25.460     0.000      2.000
17.0       4.323     33.460     0.000      2.000
18.0       4.606     37.950     0.000      2.000
18.1       4.635     38.425     3.0        5.0
18.3       4.693     39.375    18.0       20.0
18.6       4.781     40.800    51.0       51.0
19.0       4.897     42.700   110.000    110.000
20.0       5.160     47.730   311.127    311.127
21.0       5.405     53.010   571.577    571.577
24.0       6.135     70.330  1616.663   1616.663
END FTABLE 10


FTABLE      12
ROW  COL ***   Pond A4
20    5
CLOSED        OPEN ***
DEPTH        AREA    VOLUME      DISCH      DISCH ***
(FT)         (AC)    (AC-FT)     (CFS)      (CFS) ***
0.0       0.000        0.0      0.00       0.00
1.0       0.058      0.020     0.000      0.500
2.0       0.235      0.140     0.000      0.500
5.0       0.709      1.590     0.000      0.500
8.0       1.341      4.530     0.000      0.500
11.0       2.317      9.950     0.000      0.500
11.1       2.360     10.250     0.000      0.600
15.0       3.620     21.660     0.000      0.800
17.0       4.259     29.720     0.000      1.000
19.0       4.977     38.960     0.000      1.500
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DRAFT

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20.0      5.380    43.700     0.000     3.000
22.0      6.200    55.000     0.000     3.000
25.0      7.467    76.270     0.000     3.000
27.9      8.600   100.000     0.000     3.000
28.1      8.764   101.443    20.239    23.239
28.3      8.844   103.229   105.163   108.163
28.6      8.964   105.908   297.445   297.445
29.0      9.124   109.480   640.000   640.000
31.0      9.972   128.570  3325.538  3325.538
34.0     11.187   160.400  9406.041  9406.041
END FTABLE 12


FTABLE      18
ROW  COL ***   Pond b5
20    5
CLOSED       OPEN ***
DEPTH       AREA    VOLUME      DISCH      DISCH ***
(FT)        (AC)   (AC-FT)      (CFS)      (CFS) ***
0.0       0.000       0.0       0.00       0.00
2.0       0.077     0.030     0.000     0.500
4.0       0.272     0.380     0.000     0.500
5.0       0.377     0.700     0.000     0.500
7.0       0.605     1.690     0.000     0.500
10.0        0.959     4.010     0.000     0.500
12.0        1.266     6.220     0.000     0.500
13.0        1.500     7.500     0.000     2.000
16.0        1.998    12.740     0.000     2.000
20.0        2.739    22.150     0.000     2.000
24.0        3.750    35.080     0.000     2.000
26.0        4.346    43.210     0.000     2.000
30.0        5.441    63.720     0.000     2.000
31.9        6.050    73.700     0.000     2.000
32.1        6.118    76.875    13.044    15.044
32.3        6.186    78.125    67.781    69.781
32.6        6.286    80.000   191.713   193.713
33.0        6.421    82.500   412.500   412.500
34.0        6.913    89.170  1166.726  1166.726
38.0        8.269   119.540  6062.487  6062.487
END FTABLE 18


FTABLE      11
ROWS COLS *****
20    5
F-table FOR R11                                        ****

surface              infilt.  dwnstrm. ****
depth       area    volume    outlet     outlet ****
dischg.   dischg. ****
(ft)    (acres) (ac-ft)        (cfs)      (cfs) ****
0.0       0.000     0.000     0.000     0.000
0.5       0.073     0.036     0.055     4.465
1.0       0.073     0.073     0.066    12.690
1.5       0.112     0.119     0.092    23.116
2.0       0.151     0.185     0.118    40.771
2.3       0.175     0.234     0.134    55.474
2.6       0.198     0.290     0.149    73.659
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DRAFT

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3.0      0.229      0.376      0.170    103.867
4.0      0.307      0.644      0.222    213.573
5.0      0.385      0.990      0.274    380.379
6.0      0.463      1.415      0.326    613.895
7.0      0.541      1.917      0.378    923.074
8.0      0.619      2.497      0.430   1316.363
9.0      0.697      3.155      0.482   1801.800
10.0      0.775      3.892      0.535   2387.081
11.0      0.853      4.706      0.587   3079.615
12.0      0.931      5.598      0.639   3886.562
13.0      1.009      6.568      0.691   4814.863
14.0      1.087      7.616      0.743   5871.263
15.0      1.165      8.742      0.795   7062.337

END FTABLE 11

FTABLE     13
ROWS COLS *****
20    5

F-table FOR R13                                              ****

surface              infilt.   dwnstrm. ****
depth       area    volume    outlet     outlet ****
dischg.   dischg. ****
(ft)    (acres) (ac-ft)/h      (cfs)      (cfs)    ****
0.0      0.000      0.000      0.000      0.000
0.5      0.112      0.056      0.084      3.582
1.0      0.112      0.112      0.101     10.246
1.5      0.172      0.183      0.141     18.683
2.0      0.232      0.284      0.181     32.985
2.3      0.268      0.359      0.205     44.899
2.6      0.304      0.445      0.229     59.638
3.0      0.352      0.576      0.261     84.125
4.0      0.471      0.987      0.341    173.071
5.0      0.591      1.518      0.420    308.330
6.0      0.710      2.168      0.500    497.699
7.0      0.830      2.938      0.580    748.439
8.0      0.949      3.828      0.660   1067.401
9.0      1.069      4.837      0.740   1461.105
10.0      1.188      5.965      0.819   1935.793
11.0      1.308      7.213      0.899   2497.475
12.0      1.427      8.581      0.979   3151.957
13.0      1.547     10.068      1.059   3904.871
14.0      1.666     11.674      1.138   4761.687
15.0      1.786     13.400      1.218   5727.738

END FTABLE 13

FTABLE     14
ROWS COLS *****
13    5
reach 14 pond b3                          ***
spillway   ****
depth Surface A    volume    outflow    ***
(ft)    (acres)   (ac-ft)     (cfs)    ****
0.0      0.000      0.000      0.000    0.0
1.0      0.000      0.000      0.000    0.0
```

DRAFT

```
2.0      0.096     0.030      0.000    0.0
3.0      0.246     0.200      0.000    0.0
4.0      0.368     0.500      0.000    0.0
5.0      0.418     0.900      0.000    0.0
6.0      0.487     1.350      0.000    0.0
7.0      0.568     1.870     11.239    0.0
8.0      0.640     2.480    101.384    0.0
9.0      0.700     3.150    238.588    0.0
10.0      0.763     3.880    410.041    0.0
11.0      0.827     4.870    609.900    0.0
12.0      0.902     5.540    834.584    0.0
END FTABLE 14

FTABLE      15
ROWS COLS *****
20    5
F-table FOR R15   ****

surface              infilt.  dwnstrm.   ****
depth       area    volume    outlet     outlet   ****
dischg.   dischg.   ****
(ft)    (acres) (ac-ft)/h      (cfs)      (cfs)    ****
0.0      0.000     0.000      0.000      0.000
0.5      0.029     0.015      0.022      4.126
1.0      0.029     0.029      0.026     11.680
1.5      0.045     0.048      0.037     21.260
2.0      0.061     0.074      0.047     37.475
2.3      0.070     0.094      0.054     50.976
2.6      0.079     0.116      0.060     67.671
3.0      0.092     0.150      0.068     95.403
4.0      0.123     0.258      0.089    196.103
5.0      0.154     0.396      0.110    349.202
6.0      0.185     0.566      0.131    563.517
7.0      0.217     0.767      0.151    847.266
8.0      0.248     0.999      0.172   1208.200
9.0      0.279     1.263      0.193   1653.695
10.0      0.310     1.558      0.214   2190.812
11.0      0.341     1.883      0.235   2826.352
12.0      0.373     2.241      0.256   3566.885
13.0      0.404     2.629      0.276   4418.778
14.0      0.435     3.048      0.297   5388.225
15.0      0.466     3.499      0.318   6481.257

END FTABLE 15

FTABLE      16
ROWS COLS *****
14    5
reach 16 pond b4                         ****
surface            spillway ****
depth       area    volume    outflow ****
(ft)    (acres)    (ac-ft)     (cfs)    ****
0.0      0.000     0.000      0.000   0.0
1.0      0.029     0.010      0.000   0.0
2.0      0.149     0.090      0.000   0.0
3.0      0.251     0.290      0.000   0.0
3.8      0.382     0.554      0.000   0.0
3.82      0.386     0.562      0.156   0.0
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DRAFT

```
3.85      0.390      0.571      0.615  0.0
3.9      0.398      0.587      1.739  0.0
4.0      0.414      0.620      4.919  0.0
4.5      0.465      0.850     32.211  0.0
5.0      0.515      1.080     72.299  0.0
6.0      0.645      1.660    179.472  0.0
7.0      0.741      2.350    314.838  0.0
8.0      0.811      3.130    473.409  0.0

END FTABLE 16


FTABLE      17
ROWS COLS *****
20    5
F-table FOR R17 ****

surface              infilt.  dwnstrm.   ****
depth       area     volume    outlet     outlet    ****
dischg.   dischg.   ****
(ft)    (acres) (ac-ft)/h     (cfs)      (cfs)    ****
0.0      0.000      0.000     0.000      0.000
0.5      0.088      0.044     0.066      4.394
1.0      0.088      0.088     0.079     12.508
1.5      0.135      0.143     0.110     22.790
2.0      0.182      0.222     0.142     40.206
2.3      0.210      0.281     0.160     54.711
2.6      0.238      0.348     0.179     72.652
3.0      0.275      0.451     0.204    102.455
4.0      0.369      0.773     0.266    210.697
5.0      0.462      1.188     0.329    375.283
6.0      0.556      1.697     0.391    605.694
7.0      0.649      2.299     0.454    910.767
8.0      0.743      2.995     0.516   1298.836
9.0      0.836      3.785     0.579   1777.831
10.0      0.930      4.668     0.641   2355.349
11.0      1.023      5.645     0.704   3038.699
12.0      1.117      6.715     0.766   3834.946
13.0      1.210      7.878     0.828   4750.940
14.0      1.304      9.136     0.891   5793.337
15.0      1.398     10.486     0.953   6968.623

END FTABLE 17


FTABLE      19
ROWS COLS *****
16    5
F-table FOR R19                                             ****

surface              infilt.  dwnstrm.   ****
depth       area     volume    outlet     outlet    ****
dischg.   dischg.   ****
(ft)    (acres) (ac-ft)/h     (cfs)      (cfs)    ****
0.0      0.000      0.000     0.000      0.000
0.5      0.063      0.032     0.048      5.537
1.0      0.064      0.063     0.057     15.702
1.5      0.097      0.103     0.080     28.592
```

DRAFT

```
2.0     0.131    0.161    0.102    50.414
2.3     0.151    0.203    0.116    68.584
2.6     0.172    0.251    0.129    91.057
3.0     0.199    0.325    0.147   128.384
4.0     0.266    0.558    0.192   263.939
5.0     0.334    0.858    0.238   470.038
6.0     0.401    1.225    0.283   758.551
7.0     0.469    1.660    0.328  1140.543
8.0     0.536    2.163    0.373  1626.449
9.0     0.604    2.733    0.418  2226.197
10.0     0.671    3.371    0.463  2949.297
11.0     0.739    4.076    0.508  3804.901
12.0     0.807    4.849    0.553  4801.856
13.0     0.874    5.689    0.598  5948.736
14.0     0.942    6.597    0.643  7253.877
15.0     1.009    7.572    0.688  8725.399
END FTABLE 19

FTABLE      20
ROWS COLS *****
16    6
F-table FOR R20                                             ****

surface              infilt.  dwnstrm.    OUTLET ****
depth       area    volume    outlet    outlet          TO ****
dischg.   dischg.        R24 ****
(ft)    (acres) (ac-ft)/h      (cfs)      (cfs)      (cfs) ****
0.0     0.000    0.000    0.000     0.000     0.000
0.5     0.249    0.124    0.625     2.571     0.000
1.0     0.250    0.249    0.750     8.270     0.000
1.5     0.383    0.407    1.046    15.365     0.000
2.0     0.516    0.632    1.342    27.572     0.000
2.3     0.596    0.799    1.519    37.802     0.000
2.6     0.675    0.989    1.697    50.494     0.000
3.0     0.782    1.281    1.933    71.632     0.000
4.0     1.048    2.196    2.525   148.652     0.000
5.0     1.313    3.376    3.116   266.046     0.000
6.0     1.579    4.823    3.708     0.000   430.612
7.0     1.845    6.535    4.299     0.000   648.680
8.0     2.111    8.513    4.891     0.000   926.223
9.0     2.377   10.757    5.482     0.000  1268.924
10.0     2.643   13.267    6.074     0.000  1682.225
11.0     2.909   16.042    6.666     0.000  2171.366
12.0     3.174   19.084    7.257     0.000  2741.409
13.0     3.440   22.391    7.849     0.000  3397.262
14.0     3.706   25.964    8.440     0.000  4143.695
15.0     3.972   29.803    9.032     0.000  4985.357

END FTABLE 20

FTABLE      21
ROWS COLS *****
12    5
F-table FOR R21  -  POND B1                                 ****

surface              infilt.  dwnstrm.  ****
depth       area    volume    outlet    outlet  ****
dischg.   dischg.   ****
```

DRAFT

```
(ft)    (acres) (ac-ft)/h     (cfs)     (cfs)    ****
0.0      0.000    0.000     0.000     0.000
1.0      0.020    0.010     0.000     0.000
2.0      0.180    0.090     0.000     0.000
3.0      0.350    0.350     0.000     0.000
4.0      0.480    0.760     0.000     0.000
5.0      0.560    1.270     0.000     0.000
6.0      0.680    1.890     3.264     0.000
7.0      0.800    2.630    13.440     0.000
8.0      0.940    3.500    27.072     0.000
9.0      1.070    4.500    43.656     0.000
10.0      1.190    5.620    62.832     0.000
11.0      1.360    6.900    88.128     0.000

END FTABLE 21

FTABLE     22
ROWS COLS *****
17    5
F-table FOR R22                                              ****

surface             infilt.  dwnstrm.   ****
depth       area    volume   outlet     outlet   ****
dischg.   dischg.   ****
(ft)    (acres) (ac-ft)/h     (cfs)     (cfs)    ****
0.0      0.000    0.000     0.000     0.000
1.0      0.020    0.010     0.000     0.000
2.0      0.160    0.080     0.000     0.000
3.0      0.310    0.320     0.000     0.000
4.0      0.410    0.670     0.000     0.000
5.0      0.500    1.120     0.000     0.000
6.0      0.600    1.670     0.000     0.000
7.0      0.690    2.320     0.000     0.000
8.0      0.800    3.060     0.000     0.000
9.0      0.900    3.910     0.000     0.000
10.0      0.990    4.850     1.188     0.000
11.0      1.090    5.890    14.388     0.000
12.0      1.200    7.030    30.240     0.000
13.0      1.330    8.300    49.476     0.000
14.0      1.460    9.690    71.832     0.000
15.0      1.570   11.200    96.084     0.000
16.0      1.670   12.820   122.244     0.000
END FTABLE 22

FTABLE     23
ROWS COLS *****
20    5
surface             infilt.  dwnstrm.   ****
depth       area    volume   outlet     outlet   ****
dischg.   dischg.   ****
(ft)    (acres) (ac-ft)/h     (cfs)     (cfs)    ****
0.0      0.000    0.000     0.000     0.000
0.5      0.029    0.015     0.022     2.911
1.0      0.029    0.029     0.026     8.251
1.5      0.045    0.048     0.037    15.023
2.0      0.061    0.074     0.047    26.485
2.3      0.070    0.094     0.054    36.030
2.6      0.079    0.116     0.060    47.833
```

DRAFT

```
3.0       0.092      0.150      0.068     67.440
4.0       0.123      0.258      0.089    138.640
5.0       0.154      0.396      0.110    246.891
6.0       0.185      0.566      0.131    398.429
7.0       0.217      0.767      0.151    599.063
8.0       0.248      0.999      0.172    854.276
9.0       0.279      1.263      0.193   1169.282
10.0       0.310      1.558      0.214   1549.076
11.0       0.341      1.883      0.235   1998.464
12.0       0.373      2.241      0.256   2522.093
13.0       0.404      2.629      0.276   3124.467
14.0       0.435      3.048      0.297   3809.963
15.0       0.466      3.499      0.318   4582.847

END FTABLE 23

FTABLE      24
ROWS COLS *****  CENTRL AV DRNG DITCH EAST OF PLANT
20    5
surface              infilt.  dwnstrm.   ****
depth       area    volume    outlet     outlet   ****
dischg.   dischg.   ****
(ft)    (acres) (ac-ft)/h     (cfs)      (cfs)   ****
0.0       0.000      0.000      0.000      0.000
0.5       0.321      0.160      0.807      4.167
1.0       0.323      0.321      0.968     13.067
1.5       0.494      0.526      1.350     24.184
2.0       0.666      0.816      1.732     43.256
2.3       0.769      1.031      1.961     59.221
2.6       0.872      1.277      2.190     79.017
3.0       1.009      1.653      2.495    111.971
4.0       1.352      2.834      3.259    231.968
5.0       1.695      4.358      4.022    414.788
6.0       2.039      6.225      4.786    671.004
7.0       2.382      8.435      5.549   1010.469
8.0       2.725     10.988      6.313   1442.475
9.0       3.068     13.884      7.076   1975.865
10.0       3.411     17.124      7.840   2619.108
11.0       3.754     20.707      8.603   3380.355
12.0       4.097     24.632      9.367   4267.484
13.0       4.440     28.901     10.131   5288.130
14.0       4.784     33.513     10.894   6449.717
15.0       5.127     38.468     11.658   7759.477

END FTABLE 24

FTABLE      25
ROWS COLS *****        POND A1
13    5
surface              spillway             ****
depth       area    volume    outflow               ****
(ft)    (acres)   (ac-ft)     (cfs)               ****
0.0       0.000      0.000      0.000      0.000
1.0       0.000      0.000      0.000      0.000
2.0       0.440      0.160      0.000      0.000
3.0       0.620      0.690      0.000      0.000
4.0       0.770      1.380      0.000      0.000
5.0       0.910      2.210      0.000      0.000
```

DRAFT

```
6.0      0.980      3.160      0.000      0.000
7.0      1.060      4.180      0.000      0.000
8.0      1.150      5.280     12.420      0.000
9.0      1.230      6.470     28.044      0.000
10.0      1.320      7.750     45.936      0.000
11.0      1.400      9.110     65.520      0.000
12.0      1.550     10.580     91.140      0.000

END FTABLE 25

FTABLE      26
ROWS COLS *****    POND A2   *****
20    5
surface              spillway        ***
depth       area     volume   outflow        ***
(ft)    (acres)   (ac-ft)     (cfs)         ***
0.0      0.000      0.000      0.000      0.000
1.0      0.000      0.000      0.000      0.000
2.0      0.020      0.010      0.000      0.000
3.0      0.040      0.040      0.000      0.000
4.0      0.090      0.110      0.000      0.000
5.0      0.190      0.250      0.000      0.000
6.0      0.310      0.490      0.000      0.000
7.0      0.440      0.870      0.000      0.000
8.0      0.600      1.390      0.000      0.000
9.0      0.770      2.070      0.000      0.000
10.0      0.930      2.920      0.000      0.000
11.0      1.130      3.950      0.000      0.000
12.0      1.260      5.160      0.000      0.000
13.0      1.450      6.520      0.000      0.000
14.0      1.630      8.060      0.000      0.000
15.0      1.820      9.790      0.000      0.000
16.0      2.000     11.700      0.000      0.000
17.0      2.200     13.790      0.000      0.000
18.0      2.430     16.110      0.000      0.000
20.0      2.860     21.390      0.000      0.000
22.0      3.270     27.560      0.000      0.000
23.0      3.430     30.910     32.928      0.000
24.0      3.590     34.420     77.544      0.000
25.0      3.770     38.100    126.672      0.000
END FTABLE 26

FTABLE      27
ROWS COLS *****
20    5
surface               infilt.  dwnstrm.    ****
depth       area     volume    outlet     outlet    ****
dischg.   dischg.   ****
(ft)    (acres)  (ac-ft)/h     (cfs)      (cfs)    ****
0.0      0.000      0.000      0.000      0.000
0.5      0.073      0.036      0.055      1.741
1.0      0.073      0.073      0.066      5.003
1.5      0.112      0.119      0.092      9.130
2.0      0.151      0.185      0.118     16.130
2.3      0.175      0.234      0.134     21.963
2.6      0.198      0.290      0.149     29.179
3.0      0.229      0.376      0.170     41.170
4.0      0.307      0.644      0.222     84.732
```

DRAFT

```
5.0      0.385      0.990      0.274    150.982
6.0      0.463      1.415      0.326    243.740
7.0      0.541      1.917      0.378    366.564
8.0      0.619      2.497      0.430    522.810
9.0      0.697      3.155      0.482    715.672
10.0      0.775      3.892      0.535    948.208
11.0      0.853      4.706      0.587   1223.362
12.0      0.931      5.598      0.639   1543.978
13.0      1.009      6.568      0.691   1912.816
14.0      1.087      7.616      0.743   2332.556
15.0      1.165      8.742      0.795   2805.809
END FTABLE 27


FTABLE      28
ROWS COLS *****
20    5
surface               infilt.  dwnstrm.    ****
depth       area     volume     outlet      outlet   ****
dischg.   dischg.   ****
(ft)    (acres) (ac-ft)/h      (cfs)       (cfs)    ****
0.0      0.000      0.000      0.000      0.000
0.5      0.073      0.036      0.055      1.741
1.0      0.073      0.073      0.066      5.003
1.5      0.112      0.119      0.092      9.130
2.0      0.151      0.185      0.118     16.130
2.3      0.175      0.234      0.134     21.963
2.6      0.198      0.290      0.149     29.179
3.0      0.229      0.376      0.170     41.170
4.0      0.307      0.644      0.222     84.732
5.0      0.385      0.990      0.274    150.982
6.0      0.463      1.415      0.326    243.740
7.0      0.541      1.917      0.378    366.564
8.0      0.619      2.497      0.430    522.810
9.0      0.697      3.155      0.482    715.672
10.0      0.775      3.892      0.535    948.208
11.0      0.853      4.706      0.587   1223.362
12.0      0.931      5.598      0.639   1543.978
13.0      1.009      6.568      0.691   1912.816
14.0      1.087      7.616      0.743   2332.556
15.0      1.165      8.742      0.795   2805.809
END FTABLE 28


FTABLE      29
ROWS COLS *****
20    5
surface               infilt.  dwnstrm.    ****
depth       area     volume     outlet      outlet   ****
dischg.   dischg.   ****
(ft)    (acres) (ac-ft)/h      (cfs)       (cfs)    ****
0.0      0.000      0.000      0.000      0.000
0.5      0.073      0.036      0.055      1.741
1.0      0.073      0.073      0.066      5.003
1.5      0.112      0.119      0.092      9.130
2.0      0.151      0.185      0.118     16.130
2.3      0.175      0.234      0.134     21.963
2.6      0.198      0.290      0.149     29.179
```

DRAFT

```
3.0      0.229      0.376      0.170      41.170
4.0      0.307      0.644      0.222      84.732
5.0      0.385      0.990      0.274     150.982
6.0      0.463      1.415      0.326     243.740
7.0      0.541      1.917      0.378     366.564
8.0      0.619      2.497      0.430     522.810
9.0      0.697      3.155      0.482     715.672
10.0      0.775      3.892      0.535     948.208
11.0      0.853      4.706      0.587    1223.362
12.0      0.931      5.598      0.639    1543.978
13.0      1.009      6.568      0.691    1912.816
14.0      1.087      7.616      0.743    2332.556
15.0      1.165      8.742      0.795    2805.809
END FTABLE 29


FTABLE     30
ROWS COLS *****
20     5
surface              infilt.   dwnstrm.    ****
depth       area    volume    outlet     outlet   ****
dischg.   dischg.   ****
(ft)    (acres) (ac-ft)/h     (cfs)      (cfs)    ****
0.0      0.000      0.000      0.000      0.000
0.5      0.073      0.036      0.055      1.741
1.0      0.073      0.073      0.066      5.003
1.5      0.112      0.119      0.092      9.130
2.0      0.151      0.185      0.118     16.130
2.3      0.175      0.234      0.134     21.963
2.6      0.198      0.290      0.149     29.179
3.0      0.229      0.376      0.170     41.170
4.0      0.307      0.644      0.222     84.732
5.0      0.385      0.990      0.274    150.982
6.0      0.463      1.415      0.326    243.740
7.0      0.541      1.917      0.378    366.564
8.0      0.619      2.497      0.430    522.810
9.0      0.697      3.155      0.482    715.672
10.0      0.775      3.892      0.535     948.208
11.0      0.853      4.706      0.587    1223.362
12.0      0.931      5.598      0.639    1543.978
13.0      1.009      6.568      0.691    1912.816
14.0      1.087      7.616      0.743    2332.556
15.0      1.165      8.742      0.795    2805.809
END FTABLE 30


FTABLE     31
ROWS COLS *****
20     5
surface              infilt.   dwnstrm.    ****
depth       area    volume    outlet     outlet   ****
dischg.   dischg.   ****
(ft)    (acres) (ac-ft)/h     (cfs)      (cfs)    ****
0.0      0.000      0.000      0.000      0.000
0.5      0.073      0.036      0.055      1.741
1.0      0.073      0.073      0.066      5.003
1.5      0.112      0.119      0.092      9.130
2.0      0.151      0.185      0.118     16.130
```

DRAFT

```
2.3      0.175     0.234     0.134     21.963
2.6      0.198     0.290     0.149     29.179
3.0      0.229     0.376     0.170     41.170
4.0      0.307     0.644     0.222     84.732
5.0      0.385     0.990     0.274    150.982
6.0      0.463     1.415     0.326    243.740
7.0      0.541     1.917     0.378    366.564
8.0      0.619     2.497     0.430    522.810
9.0      0.697     3.155     0.482    715.672
10.0      0.775     3.892     0.535    948.208
11.0      0.853     4.706     0.587   1223.362
12.0      0.931     5.598     0.639   1543.978
13.0      1.009     6.568     0.691   1912.816
14.0      1.087     7.616     0.743   2332.556
15.0      1.165     8.742     0.795   2805.809
END FTABLE 31

END FTABLES


*** {{{{{{{{{{{{{{{{{{{{{{{{{{{   PLTGEN   }}}}}}}}}}}}}}}}}}}}}}}}}}} ***

PLTGEN
PLOTINFO
*** FILE is the FORTRAN unit to plot to
*** NPT is the number of point-valued times series to be plotted
*** NMN is the number of mean-valued time series to be plotted
*** LABLFG -1=no labels; 0=1 set of labels; 1=repeat labels for each year
*** PYRend last month of "your" year
*** PIVL is number of basic time intervals to aggregate to interval
*** to be output to the plot file
# -  # FILE  NPT  NMN LABL  PYR PIVL ***
1        71    0   10    1   12   24
2        72    0   10    1   12   24
3        73    0   10    1   12   24
4        74    0   10    1   12   24
5        75    0   10    1   12   24
6        76    0   10    1   12   24
7        77    0   10    1   12   24
8        78    0   10    1   12   24
9        79    0   10    1   12   24
10        80    0   10    1   12   24
11        81    0   10    1   12   24
12        82    0   10    1   12   24
13        83    0   10    1   12   24
14        84    0   10    1   12   24
15        85    0   10    1   12   24
16        86    0   10    1   12   24
17        87    0   10    1   12   24
18        88    0   10    1   12   24
19        89    0   10    1   12   24
20        90    0   10    1   12   24
21        91    0   10    1   12   24
END PLOTINFO

GEN-LABELS
# -  #<----------------Title----------------->   ***   <------Y axis------>
1   21SIMPLE RUN                                        bs
```

```
END GEN-LABELS

SCALING
*** YMIN is y axis minimum, YMAX is y axis maximum, IVLIN is the horizontal
*** (time) scale in number of intervals per inch
# -  #       YMIN      YMAX      IVLIN ***
1   21         0.       10.0        1.0
END SCALING

CURV-DATA          (first curve)  (looks to "PLTGEN 1 FIELD 1")
<-Curve label--> Line Intg  Col Tran ***
*** type is method of drawing line; 0=straight line between data points,
*** do not display data points; postive value=straight line between points,
*** plot data points at interval 'value'; negative value=no line between
*** data points, plot data points at interval 'value'
*** eqv is  the integer equivalent for the data point symbol
*** code is color code of pen to be used
*** 2nd code is how to aggregate from basic interval to plotting units interval
# -  #      <-Curve label--> type  eqv code code ***
1          R07 DEPSCR T/DAY     5     3     1 SUM
2          R07 DQAL AM PC/L     5     3     1 AVER
3          A-1 DEPSCR T/DAY     5     3     1 SUM
4          A-1 DQAL AM PC/L     5     3     1 AVER
5          A-2 DEPSCR T/DAY     5     3     1 SUM
6          A-2 DQAL AM PC/L     5     3     1 AVER
7          A-3 DEPSCR T/DAY     5     3     1 SUM
8          A-3 DQAL AM PC/L     5     3     1 AVER
9          A-4 DEPSCR T/DAY     5     3     1 SUM
10          A-4 DQAL AM PC/L     5     3     1 AVER
11          B-1 DEPSCR T/DAY     5     3     1 SUM
12          B-1 DQAL AM PC/L     5     3     1 AVER
13          B-2 DEPSCR T/DAY     5     3     1 SUM
14          B-2 DQAL AM PC/L     5     3     1 AVER
15          B-3 DEPSCR T/DAY     5     3     1 SUM
16          B-3 DQAL AM PC/L     5     3     1 AVER
17          B-4 DEPSCR T/DAY     5     3     1 SUM
18          B-4 DQAL AM PC/L     5     3     1 AVER
19          B-5 DEPSCR T/DAY     5     3     1 SUM
20          B-5 DQAL AM PC/L     5     3     1 AVER
21 ***      R10 ROSED  T/DAY     5     3     1 SUM
21          R25 VOL  AC-FT       5     3     1 AVER
END CURV-DATA

CURV-DATA          (fourth crve)  (looks to "PLTGEN 1 FIELD 2")
<-Curve label--> Line Intg  Col Tran ***
# -  #      <-Curve label--> type  eqv code code ***
1          R07 DSQAL AM PCI     5     4     1 SUM
2          R07 DQAL PU PC/L     5     3     1 AVER
3          A-1 DSQAL AM PCI     5     4     1 SUM
4          A-1 DQAL PU PC/L     5     3     1 AVER
5          A-2 DSQAL AM PCI     5     4     1 SUM
6          A-2 DQAL PU PC/L     5     3     1 AVER
7          A-3 DSQAL AM PCI     5     4     1 SUM
8          A-3 DQAL PU PC/L     5     3     1 AVER
9          A-4 DSQAL AM PCI     5     4     1 SUM
10          A-4 DQAL PU PC/L     5     3     1 AVER
11          B-1 DSQAL AM PCI     5     4     1 SUM
12          B-1 DQAL PU PC/L     5     3     1 AVER
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13          B-2 DSQAL AM PCI     5     4     1 SUM
14          B-2 DQAL PU PC/L     5     3     1 AVER
15          B-3 DSQAL AM PCI     5     4     1 SUM
16          B-3 DQAL PU PC/L     5     3     1 AVER
17          B-4 DSQAL AM PCI     5     4     1 SUM
18          B-4 DQAL PU PC/L     5     3     1 AVER
19          B-5 DSQAL AM PCI     5     4     1 SUM
20          B-5 DQAL PU PC/L     5     3     1 AVER
21   ***    R05 ROSED T/DAY      5     4     1 SUM
21          R26 VOL  AC-FT       5     3     1 AVER
END CURV-DATA

CURV-DATA          (Third curve)  (looks to "PLTGEN 1 FIELD 3")
<-Curve label--> Line Intg  Col Tran ***
# -  #     <-Curve label--> type  eqv code code ***
1          R07 DSQAL PU PCI     5     5     1 SUM
2          R07 DQAL SB GM/L     5     5     1 AVER
3          A-1 DSQAL PU PCI     5     5     1 SUM
4          A-1 DQAL SB GM/L     5     5     1 AVER
5          A-2 DSQAL PU PCI     5     5     1 SUM
6          A-2 DQAL SB GM/L     5     5     1 AVER
7          A-3 DSQAL PU PCI     5     5     1 SUM
8          A-3 DQAL SB GM/L     5     5     1 AVER
9          A-4 DSQAL PU PCI     5     5     1 SUM
10          A-4 DQAL SB GM/L     5     5     1 AVER
11          B-1 DSQAL PU PCI     5     5     1 SUM
12          B-1 DQAL SB GM/L     5     5     1 AVER
13          B-2 DSQAL PU PCI     5     5     1 SUM
14          B-2 DQAL SB GM/L     5     5     1 AVER
15          B-3 DSQAL PU PCI     5     5     1 SUM
16          B-3 DQAL SB GM/L     5     5     1 AVER
17          B-4 DSQAL PU PCI     5     5     1 SUM
18          B-4 DQAL SB GM/L     5     5     1 AVER
19          B-5 DSQAL PU PCI     5     5     1 SUM
20          B-5 DQAL SB GM/L     5     5     1 AVER
21   ***    R08 DEPSCR T/DAY     5     5     1 SUM
21          R10 VOL  AC-FT       5     3     1 AVER
END CURV-DATA

CURV-DATA          (Sixth curve)  (looks to "PLTGEN 1 FIELD 4")
<-Curve label--> Line Intg  Col Tran ***
# -  #     <-Curve label--> type  eqv code code ***
1          R07 DSQAL SB GRM     5     6     1 SUM
2          R07 SQAL1 PU PCI     5     6     1 AVER
3          A-1 DSQAL SB GRM     5     6     1 SUM
4          A-1 SQAL1 PU PCI     5     6     1 AVER
5          A-2 DSQAL SB GRM     5     6     1 SUM
6          A-2 SQAL1 PU PCI     5     6     1 AVER
7          A-3 DSQAL SB GRM     5     6     1 SUM
8          A-3 SQAL1 PU PCI     5     6     1 AVER
9          A-4 DSQAL SB GRM     5     6     1 SUM
10          A-4 SQAL1 PU PCI     5     6     1 AVER
11          B-1 DSQAL SB GRM     5     6     1 SUM
12          B-1 SQAL1 PU PCI     5     6     1 AVER
13          B-2 DSQAL SB GRM     5     6     1 SUM
14          B-2 SQAL1 PU PCI     5     6     1 AVER
15          B-3 DSQAL SB GRM     5     6     1 SUM
16          B-3 SQAL1 PU PCI     5     6     1 AVER
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17          B-4 DSQAL SB GRM     5     6      1 SUM
18          B-4 SQAL1 PU PCI     5     6      1 AVER
19          B-5 DSQAL SB GRM     5     6      1 SUM
20          B-5 SQAL1 PU PCI     5     6      1 AVER
21   ***    R11 DEPSCR T/DAY     5     6      1 SUM
21          R12 VOL  AC-FT       5     3      1 AVER
END CURV-DATA

CURV-DATA          (Fifth curve)  (looks to "PLTGEN 1 FIELD 5")
<-Curve label--> Line Intg  Col Tran ***
# -  #     <-Curve label--> type  eqv code code ***
1          R07 SSED1  T/DAY     5    1     1 AVER
2          R07 SQAL2 PU PCI     5    1     1 AVER
3          A-1 SSED1  T/DAY     5    1     1 AVER
4          A-1 SQAL2 PU PCI     5    1     1 AVER
5          A-2 SSED1  T/DAY     5    1     1 AVER
6          A-2 SQAL2 PU PCI     5    1     1 AVER
7          A-3 SSED1  T/DAY     5    1     1 AVER
8          A-3 SQAL2 PU PCI     5    1     1 AVER
9          A-4 SSED1  T/DAY     5    1     1 AVER
10          A-4 SQAL2 PU PCI     5    1     1 AVER
11          B-1 SSED1  T/DAY     5    1     1 AVER
12          B-1 SQAL2 PU PCI     5    1     1 AVER
13          B-2 SSED1  T/DAY     5    1     1 AVER
14          B-2 SQAL2 PU PCI     5    1     1 AVER
15          B-3 SSED1  T/DAY     5    1     1 AVER
16          B-3 SQAL2 PU PCI     5    1     1 AVER
17          B-4 SSED1  T/DAY     5    1     1 AVER
18          B-4 SQAL2 PU PCI     5    1     1 AVER
19          B-5 SSED1  T/DAY     5    1     1 AVER
20          B-5 SQAL2 PU PCI     5    1     1 AVER
21 ***      R27 DEPSCR T/DAY     5    1     1 SUM
21          R21 VOL  AC-FT       5    3     1 AVER
END CURV-DATA

CURV-DATA          (Sixth curve)  (looks to "PLTGEN 1 FIELD 6")
<-Curve label--> Line Intg  Col Tran ***
# -  #     <-Curve label--> type  eqv code code ***
1          R07 SSED2  T/DAY     5    2     1 AVER
2          R07 SQAL3 PU PCI     5    2     1 AVER
3          A-1 SSED2  T/DAY     5    2     1 AVER
4          A-1 SQAL3 PU PCI     5    2     1 AVER
5          A-2 SSED2  T/DAY     5    2     1 AVER
6          A-2 SQAL3 PU PCI     5    2     1 AVER
7          A-3 SSED2  T/DAY     5    2     1 AVER
8          A-3 SQAL3 PU PCI     5    2     1 AVER
9          A-4 SSED2  T/DAY     5    2     1 AVER
10          A-4 SQAL3 PU PCI     5    2     1 AVER
11          B-1 SSED2  T/DAY     5    2     1 AVER
12          B-1 SQAL3 PU PCI     5    2     1 AVER
13          B-2 SSED2  T/DAY     5    2     1 AVER
14          B-2 SQAL3 PU PCI     5    2     1 AVER
15          B-3 SSED2  T/DAY     5    2     1 AVER
16          B-3 SQAL3 PU PCI     5    2     1 AVER
17          B-4 SSED2  T/DAY     5    2     1 AVER
18          B-4 SQAL3 PU PCI     5    2     1 AVER
19          B-5 SSED2  T/DAY     5    2     1 AVER
20          B-5 SQAL3 PU PCI     5    2     1 AVER
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21  ***    R15 DEPSCR T/DAY     5     2     1 SUM
21         R22 VOL  AC-FT       5     3     1 AVER
END CURV-DATA

CURV-DATA         (7TH   curve)  (looks to "PLTGEN 1 FIELD 7")
<-Curve label--> Line Intg  Col Tran ***
# -  #      <-Curve label--> type  eqv code code ***
1           R07 SSED3  T/DAY     5     1     1 AVER
2           R07 SQAL1 SB GRM     5     1     1 AVER
3           A-1 SSED3  T/DAY     5     1     1 AVER
4           A-1 SQAL1 SB GRM     5     1     1 AVER
5           A-2 SSED3  T/DAY     5     1     1 AVER
6           A-2 SQAL1 SB GRM     5     1     1 AVER
7           A-3 SSED3  T/DAY     5     1     1 AVER
8           A-3 SQAL1 SB GRM     5     1     1 AVER
9           A-4 SSED3  T/DAY     5     1     1 AVER
10          A-4 SQAL1 SB GRM     5     1     1 AVER
11          B-1 SSED3  T/DAY     5     1     1 AVER
12          B-1 SQAL1 SB GRM     5     1     1 AVER
13          B-2 SSED3  T/DAY     5     1     1 AVER
14          B-2 SQAL1 SB GRM     5     1     1 AVER
15          B-3 SSED3  T/DAY     5     1     1 AVER
16          B-3 SQAL1 SB GRM     5     1     1 AVER
17          B-4 SSED3  T/DAY     5     1     1 AVER
18          B-4 SQAL1 SB GRM     5     1     1 AVER
19          B-5 SSED3  T/DAY     5     1     1 AVER
20          B-5 SQAL1 SB GRM     5     1     1 AVER
21    ***   R17 DEPSCR T/DAY     5     1     1 SUM
21          R14 VOL  AC-FT       5     3     1 AVER
END CURV-DATA

CURV-DATA         (8TH   curve)  (looks to "PLTGEN 1 FIELD 8")
<-Curve label--> Line Intg  Col Tran ***
# -  #      <-Curve label--> type  eqv code code ***
1           R07 SQAL1 AM PCI     5     6     1 AVER
2           R07 SQAL2 SB GRM     5     6     1 AVER
3           A-1 SQAL1 AM PCI     5     6     1 AVER
4           A-1 SQAL2 SB GRM     5     6     1 AVER
5           A-2 SQAL1 AM PCI     5     6     1 AVER
6           A-2 SQAL2 SB GRM     5     6     1 AVER
7           A-3 SQAL1 AM PCI     5     6     1 AVER
8           A-3 SQAL2 SB GRM     5     6     1 AVER
9           A-4 SQAL1 AM PCI     5     6     1 AVER
10          A-4 SQAL2 SB GRM     5     6     1 AVER
11          B-1 SQAL1 AM PCI     5     6     1 AVER
12          B-1 SQAL2 SB GRM     5     6     1 AVER
13          B-2 SQAL1 AM PCI     5     6     1 AVER
14          B-2 SQAL2 SB GRM     5     6     1 AVER
15          B-3 SQAL1 AM PCI     5     6     1 AVER
16          B-3 SQAL2 SB GRM     5     6     1 AVER
17          B-4 SQAL1 AM PCI     5     6     1 AVER
18          B-4 SQAL2 SB GRM     5     6     1 AVER
19          B-5 SQAL1 AM PCI     5     6     1 AVER
20          B-5 SQAL2 SB GRM     5     6     1 AVER
21   ***    R23 DEPSCR T/DAY     5     6     1 SUM
21          R16 VOL  AC-FT       5     3     1 AVER
END CURV-DATA
```

```
CURV-DATA          (9TH   curve)  (looks to "PLTGEN 1 FIELD 9")
<-Curve label--> Line Intg  Col Tran ***
# -  #      <-Curve label--> type  eqv code code ***
1           R07 SQAL2 AM PCI     5     6     1 AVER
2           R07 SQAL3 SB GRM     5     6     1 AVER
3           A-1 SQAL2 AM PCI     5     6     1 AVER
4           A-1 SQAL3 SB GRM     5     6     1 AVER
5           A-2 SQAL2 AM PCI     5     6     1 AVER
6           A-2 SQAL3 SB GRM     5     6     1 AVER
7           A-3 SQAL2 AM PCI     5     6     1 AVER
8           A-3 SQAL3 SB GRM     5     6     1 AVER
9           A-4 SQAL2 AM PCI     5     6     1 AVER
10           A-4 SQAL3 SB GRM     5     6     1 AVER
11           B-1 SQAL2 AM PCI     5     6     1 AVER
12           B-1 SQAL3 SB GRM     5     6     1 AVER
13           B-2 SQAL2 AM PCI     5     6     1 AVER
14           B-2 SQAL3 SB GRM     5     6     1 AVER
15           B-3 SQAL2 AM PCI     5     6     1 AVER
16           B-3 SQAL3 SB GRM     5     6     1 AVER
17           B-4 SQAL2 AM PCI     5     6     1 AVER
18           B-4 SQAL3 SB GRM     5     6     1 AVER
19           B-5 SQAL2 AM PCI     5     6     1 AVER
20           B-5 SQAL3 SB GRM     5     6     1 AVER
21     ***   R20 DEPSCR T/DAY     5     6     1 SUM
21           R18 VOL  AC-FT       5     3     1 AVER
END CURV-DATA

CURV-DATA          (10TH  curve)  (looks to "PLTGEN 1 FIELD 10")
<-Curve label--> Line Intg  Col Tran ***
# -  #      <-Curve label--> type  eqv code code ***
1           R07 SQAL3 AM PCI     5     6     1 AVER
2           R07 ROVOL  CFS       5     6     1 SUM
3           A-1 SQAL3 AM PCI     5     6     1 AVER
4           A-1 ROVOL  CFS       5     6     1 SUM
5           A-2 SQAL3 AM PCI     5     6     1 AVER
6           A-2 ROVOL  CFS       5     6     1 SUM
7           A-3 SQAL3 AM PCI     5     6     1 AVER
8           A-3 ROVOL  CFS       5     6     1 SUM
9           A-4 SQAL3 AM PCI     5     6     1 AVER
10           A-4 ROVOL  CFS       5     6     1 SUM
11           B-1 SQAL3 AM PCI     5     6     1 AVER
12           B-1 ROVOL  CFS       5     6     1 SUM
13           B-2 SQAL3 AM PCI     5     6     1 AVER
14           B-2 ROVOL  CFS       5     6     1 SUM
15           B-3 SQAL3 AM PCI     5     6     1 AVER
16           B-3 ROVOL  CFS       5     6     1 SUM
17           B-4 SQAL3 AM PCI     5     6     1 AVER
18           B-4 ROVOL  CFS       5     6     1 SUM
19           B-5 SQAL3 AM PCI     5     6     1 AVER
20           B-5 ROVOL  CFS       5     6     1 SUM
21     ***   R19 DEPSCR T/DAY     5     6     1 SUM
21           R07 VOL  AC-FT       5     3     1 AVER
END CURV-DATA

END PLTGEN

*** { EXTERNAL SOURCE AND NETWORK ROUTING INFORMATION FOR ALL OPERATIONS } ***
```

```
EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM    540 PREC     ENGLUNDF          SAME PERLND   1  21 EXTNL  PREC
WDM    141 SOLR     ENGLUNDF          SAME PERLND   1  21 EXTNL  SOLRAD
WDM    142 DWPT     ENGLUNDF          SAME PERLND   1  21 EXTNL  DTMPG
WDM    143 TEMP     ENGLUNDF          SAME PERLND   1  21 EXTNL  GATMP
WDM    144 WIND     ENGLUNDF          SAME PERLND   1  21 EXTNL  WINMOV
WDM    145 PET      ENGLUNDF          SAME PERLND   1  21 EXTNL  PETINP
WDM    540 PREC     ENGLUNDF          SAME IMPLND   1   4 EXTNL  PREC
WDM    141 SOLR     ENGLUNDF          SAME IMPLND   1   4 EXTNL  SOLRAD
WDM    142 DWPT     ENGLUNDF          SAME IMPLND   1   4 EXTNL  DTMPG
WDM    143 TEMP     ENGLUNDF          SAME IMPLND   1   4 EXTNL  GATMP
WDM    144 WIND     ENGLUNDF          SAME IMPLND   1   4 EXTNL  WINMOV
WDM    145 PET      ENGLUNDF          SAME IMPLND   1   4 EXTNL  PETINP
WDM    146 EVAP     ENGLUNDF          SAME RCHRES   1  27 EXTNL  POTEV
WDM    540 PREC     ENGLUNDF          SAME RCHRES   1  27 EXTNL  PREC
WDM    110 CLND     ENGLUNDF          SAME RCHRES  10  10 EXTNL  COLIND 1 1
WDM    112 CLND     ENGLUNDF          SAME RCHRES  12  12 EXTNL  COLIND 1 1
WDM    118 CLND     ENGLUNDF          SAME RCHRES  18  18 EXTNL  COLIND 1 1

****   TIME SERIES TO INITIATE SEDIMENT TRANSPORT *****
WDM     47 CLOU     ENGLUNDF          SAME RCHRES   1  27 EXTNL  CLOUD
WDM    141 SOLR     ENGLUNDF          SAME RCHRES   1  27 EXTNL  SOLRAD
WDM    142 DWPT     ENGLUNDF          SAME RCHRES   1  27 EXTNL  DEWTMP
WDM    143 TEMP     ENGLUNDF          SAME RCHRES   1  27 EXTNL  GATMP
WDM    144 WIND     ENGLUNDF          SAME RCHRES   1  27 EXTNL  WIND

********** TIME SERIES           **********
********** FLOWS IN AND OUT OF REACHES:       **********
***   DSN50 is GS11 (in cfs)
***   DSN62 is GS12 (in cfs) !!updated on Oct. 5, 1994!!!
***   DSN56 is WWTP flow to B3 in ac-ft/day
***    10/1/94 - added mult. fact. of 1.1 for B5 water balance
***   DSN57 is footer drainage to GS10 (a constant 0.09 cfs & then 0.05 cfs);
***       times 1/2 for GS13
***   DSN64 is B5 to A4 (in cfs)
***   1.98 is convrsn. from cfs to ac-ft/day
***   SAME: convrsn. for daily cfs to hourly cfs (all 24 hours are the same)
***   DIV: convrsn. for ac-ft/day to ac-ft/hour (divide by 24)
WDM***  50 DGT      ENGLUNDF   0.9    SAME RCHRES  12      EXTNL  OUTDGT
WDM***  62 INFL     ENGLUNDF          SAME RCHRES  10      EXTNL  OUTDGT
WDM    356 FLOW     ENGLUNDF   1.1    DIV  RCHRES  14      EXTNL  IVOL
WDM    257 DGT      ENGLUNDF   1.98   DIV  RCHRES  19      EXTNL  IVOL
WDM    257 DGT      ENGLUNDF   1.00   DIV  RCHRES  10      EXTNL  IVOL
*** decreased footer drainage to GS13 because of A3 volume (Oct. 5) *****
WDM***  64 FLOW     ENGLUNDF   1.62   DIV  RCHRES  12      EXTNL  IVOL
WDM***  64 FLOW     ENGLUNDF   0.82   SAME RCHRES  18      EXTNL  OUTDGT
******************** 1.62 is .82 times 1.98
******************** 0.82 is to account for errors in flow measuremnt

END EXT SOURCES

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
**** see A4 water balance file for descriptn. of multiplctn. factors
***  "OVOL 2" implies that only water from exit 2 flows to next RCHRES, i.e.,
```

```
****  seepage from RCHRES 1 (exit 1) does not flow to next RCHRES [confirm!]
PERLND   1 PWATER PERO            19.4      RCHRES   1      EXTNL  IVOL
PERLND   2 PWATER PERO            20.0      RCHRES   2      EXTNL  IVOL
IMPLND   1 IWATER SURO             1.1      RCHRES   2      EXTNL  IVOL
RCHRES   2 HYDR   OVOL   2         1.0      RCHRES   3      EXTNL  IVOL
RCHRES   1 HYDR   OVOL   2         1.0      RCHRES   4      EXTNL  IVOL
RCHRES   3 HYDR   OVOL   2         1.0      RCHRES   5      EXTNL  IVOL
PERLND   3 PWATER PERO            11.4      RCHRES   4      EXTNL  IVOL
PERLND   4 PWATER PERO            16.3      RCHRES   5      EXTNL  IVOL
PERLND   5 PWATER PERO             4.0      RCHRES   6      EXTNL  IVOL
RCHRES   4 HYDR   OVOL   2         1.0      RCHRES   6      EXTNL  IVOL
RCHRES   5 HYDR   OVOL   2         1.0      RCHRES   6      EXTNL  IVOL
RCHRES   6 HYDR   OVOL   2         1.0      RCHRES   7      EXTNL  IVOL
PERLND   6 PWATER PERO            20.2      RCHRES   7      EXTNL  IVOL
**** see 6/29/94 notes for explanation of mult. factors  ****
**** start core area and ponds ****
PERLND   7 PWATER PERO            12.5      RCHRES   8      EXTNL  IVOL
PERLND   8 PWATER PERO             0.4      RCHRES   9      EXTNL  IVOL
PERLND   9 PWATER PERO             3.8      RCHRES  10      EXTNL  IVOL
PERLND  10 PWATER PERO             1.6      RCHRES  12      EXTNL  IVOL
PERLND  11 PWATER PERO             1.1      RCHRES  14      EXTNL  IVOL
PERLND  12 PWATER PERO             1.1      RCHRES  16      EXTNL  IVOL
PERLND  13 PWATER PERO             2.5      RCHRES  18      EXTNL  IVOL
PERLND  14 PWATER PERO             1.8      RCHRES  20      EXTNL  IVOL
IMPLND   2 IWATER SURO             8.0      RCHRES   8      EXTNL  IVOL
****** changed IMPLND 2 mult. factor on Oct. 5 to account for
*****  A3 volume
IMPLND   3 IWATER SURO             0.4      RCHRES   9      EXTNL  IVOL
IMPLND   4 IWATER SURO             7.3      RCHRES  20      EXTNL  IVOL
RCHRES   8 HYDR   OVOL   2         1.0      RCHRES  10      EXTNL  IVOL
RCHRES   9 HYDR   OVOL   2         1.0      RCHRES  10      EXTNL  IVOL
PERLND  19 PWATER PERO             1.2      RCHRES  25      EXTNL  IVOL
PERLND  20 PWATER PERO             2.5      RCHRES  26      EXTNL  IVOL
RCHRES  25 HYDR   ROVOL            1.0      RCHRES  26      EXTNL  IVOL
RCHRES  26 HYDR   ROVOL            1.0      RCHRES  10      EXTNL  IVOL
RCHRES  10 HYDR   ROVOL            1.0      RCHRES  11      EXTNL  IVOL
RCHRES  11 HYDR   OVOL   2         1.0      RCHRES  27      EXTNL  IVOL
PERLND  21 PWATER PERO             1.6      RCHRES  27      EXTNL  IVOL
RCHRES  27 HYDR   OVOL   2         1.0      RCHRES  12      EXTNL  IVOL
RCHRES  12 HYDR   ROVOL            1.0      RCHRES  13      EXTNL  IVOL
RCHRES  13 HYDR   OVOL   2         1.0      RCHRES   4      EXTNL  IVOL
**************   added B1 and B2 on 10/4/94 **********
PERLND  15 PWATER PERO             1.4      RCHRES  21      EXTNL  IVOL
PERLND  16 PWATER PERO             .47      RCHRES  22      EXTNL  IVOL
RCHRES  21 HYDR   ROVOL            1.0      RCHRES  22      EXTNL  IVOL
RCHRES  22 HYDR   ROVOL            1.0      RCHRES  14      EXTNL  IVOL
********************************************************
RCHRES  14 HYDR   ROVOL            1.0      RCHRES  15      EXTNL  IVOL
RCHRES  15 HYDR   OVOL   2         1.0      RCHRES  16      INFLOW IVOL
RCHRES  16 HYDR   ROVOL            1.0      RCHRES  17      EXTNL  IVOL
RCHRES  17 HYDR   OVOL   2         1.0      RCHRES  23      EXTNL  IVOL
RCHRES  23 HYDR   OVOL   2         1.0      RCHRES  18      EXTNL  IVOL
PERLND  17 PWATER PERO             1.5      RCHRES  23      EXTNL  IVOL
****************************still need to add EXTRA EXIT TO RCH 18!!!!!
RCHRES  18 HYDR   OVOL   2 *****   1.0      RCHRES  12      EXTNL  IVOL
RCHRES  18 HYDR   ROVOL            1.0      RCHRES  12      EXTNL  IVOL
*****************************************************
```

```
RCHRES  20 HYDR   OVOL   2           1.0      RCHRES  19      EXTNL  IVOL
RCHRES  19 HYDR   OVOL   2           1.0      RCHRES  16      EXTNL  IVOL
RCHRES  20 HYDR   OVOL   3           1.0      RCHRES  24      EXTNL  IVOL
RCHRES  24 HYDR   OVOL   2           1.0      RCHRES  23      EXTNL  IVOL
PERLND  18 PWATER PERO               2.0      RCHRES  24      EXTNL  IVOL

**** for sediment transport sequential connection *****
IMPLND   1 SOLIDS SOSLD  1 1         1.2      RCHRES   2      INFLOW ISED   1
IMPLND   1 SOLIDS SOSLD  1 1         6.0      RCHRES   2      INFLOW ISED   2
IMPLND   1 SOLIDS SOSLD  1 1         6.0      RCHRES   2      INFLOW ISED   3
IMPLND   2 SOLIDS SOSLD  1 1         9.6      RCHRES   8      INFLOW ISED   1
IMPLND   2 SOLIDS SOSLD  1 1        65.0      RCHRES   8      INFLOW ISED   2
IMPLND   2 SOLIDS SOSLD  1 1        21.4      RCHRES   8      INFLOW ISED   3
IMPLND   3 SOLIDS SOSLD  1 1         0.5      RCHRES   9      INFLOW ISED   1
IMPLND   3 SOLIDS SOSLD  1 1         2.2      RCHRES   9      INFLOW ISED   2
IMPLND   3 SOLIDS SOSLD  1 1         2.1      RCHRES   9      INFLOW ISED   3
IMPLND   4 SOLIDS SOSLD  1 1         9.0      RCHRES  20      INFLOW ISED   1
IMPLND   4 SOLIDS SOSLD  1 1        39.3      RCHRES  20      INFLOW ISED   2
IMPLND   4 SOLIDS SOSLD  1 1        39.3      RCHRES  20      INFLOW ISED   3
PERLND   1 SEDMNT SOSED  1 1        11.7      RCHRES   1      INFLOW ISED   1
PERLND   1 SEDMNT SOSED  1 1       116.5      RCHRES   1      INFLOW ISED   2
PERLND   1 SEDMNT SOSED  1 1       104.8      RCHRES   1      INFLOW ISED   3
PERLND   2 SEDMNT SOSED  1 1       150.0      RCHRES   2      INFLOW ISED   1
PERLND   2 SEDMNT SOSED  1 1        45.0      RCHRES   2      INFLOW ISED   2
PERLND   2 SEDMNT SOSED  1 1        45.0      RCHRES   2      INFLOW ISED   3
PERLND   3 SEDMNT SOSED  1 1         6.9      RCHRES   4      INFLOW ISED   1
PERLND   3 SEDMNT SOSED  1 1        68.5      RCHRES   4      INFLOW ISED   2
PERLND   3 SEDMNT SOSED  1 1        61.6      RCHRES   4      INFLOW ISED   3
PERLND   4 SEDMNT SOSED  1 1         9.8      RCHRES   5      INFLOW ISED   1
PERLND   4 SEDMNT SOSED  1 1        98.0      RCHRES   5      INFLOW ISED   2
PERLND   4 SEDMNT SOSED  1 1        88.2      RCHRES   5      INFLOW ISED   3
PERLND   5 SEDMNT SOSED  1 1         2.4      RCHRES   6      INFLOW ISED   1
PERLND   5 SEDMNT SOSED  1 1        24.0      RCHRES   6      INFLOW ISED   2
PERLND   5 SEDMNT SOSED  1 1        21.6      RCHRES   6      INFLOW ISED   3
PERLND   6 SEDMNT SOSED  1 1        12.2      RCHRES   7      INFLOW ISED   1
PERLND   6 SEDMNT SOSED  1 1       122.0      RCHRES   7      INFLOW ISED   2
PERLND   6 SEDMNT SOSED  1 1       109.8      RCHRES   7      INFLOW ISED   3
PERLND   7 SEDMNT SOSED  1 1         7.5      RCHRES   8      INFLOW ISED   1
PERLND   7 SEDMNT SOSED  1 1        75.0      RCHRES   8      INFLOW ISED   2
PERLND   7 SEDMNT SOSED  1 1        67.5      RCHRES   8      INFLOW ISED   3
PERLND   8 SEDMNT SOSED  1 1         0.2      RCHRES   9      INFLOW ISED   1
PERLND   8 SEDMNT SOSED  1 1         2.4      RCHRES   9      INFLOW ISED   2
PERLND   8 SEDMNT SOSED  1 1         2.2      RCHRES   9      INFLOW ISED   3
PERLND   9 SEDMNT SOSED  1 1        36.5      RCHRES  10      INFLOW ISED   1
PERLND   9 SEDMNT SOSED  1 1         4.6      RCHRES  10      INFLOW ISED   2
PERLND   9 SEDMNT SOSED  1 1         4.5      RCHRES  10      INFLOW ISED   3
PERLND  10 SEDMNT SOSED  1 1        34.5      RCHRES  12      INFLOW ISED   1
PERLND  10 SEDMNT SOSED  1 1         1.9      RCHRES  12      INFLOW ISED   2
PERLND  10 SEDMNT SOSED  1 1         1.9      RCHRES  12      INFLOW ISED   3
PERLND  11 SEDMNT SOSED  1 1        11.9      RCHRES  14      INFLOW ISED   1
PERLND  11 SEDMNT SOSED  1 1         0.7      RCHRES  14      INFLOW ISED   2
PERLND  11 SEDMNT SOSED  1 1         0.6      RCHRES  14      INFLOW ISED   3
PERLND  12 SEDMNT SOSED  1 1        11.9      RCHRES  16      INFLOW ISED   1
PERLND  12 SEDMNT SOSED  1 1         0.7      RCHRES  16      INFLOW ISED   2
PERLND  12 SEDMNT SOSED  1 1         0.6      RCHRES  16      INFLOW ISED   3
PERLND  13 SEDMNT SOSED  1 1        27.0      RCHRES  18      INFLOW ISED   1
PERLND  13 SEDMNT SOSED  1 1         1.5      RCHRES  18      INFLOW ISED   2
PERLND  13 SEDMNT SOSED  1 1         1.5      RCHRES  18      INFLOW ISED   3
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PERLND  14 SEDMNT SOSED  1 1      1.0   RCHRES  20    INFLOW ISED   1
PERLND  14 SEDMNT SOSED  1 1     10.8   RCHRES  20    INFLOW ISED   2
PERLND  14 SEDMNT SOSED  1 1      9.8   RCHRES  20    INFLOW ISED   3
PERLND  15 SEDMNT SOSED  1 1     15.1   RCHRES  21    INFLOW ISED   1
PERLND  15 SEDMNT SOSED  1 1      0.8   RCHRES  21    INFLOW ISED   2
PERLND  15 SEDMNT SOSED  1 1      0.8   RCHRES  21    INFLOW ISED   3
PERLND  16 SEDMNT SOSED  1 1      5.0   RCHRES  22    INFLOW ISED   1
PERLND  16 SEDMNT SOSED  1 1      0.3   RCHRES  22    INFLOW ISED   2
PERLND  16 SEDMNT SOSED  1 1      0.3   RCHRES  22    INFLOW ISED   3
PERLND  17 SEDMNT SOSED  1 1      1.6   RCHRES  23    INFLOW ISED   1
PERLND  17 SEDMNT SOSED  1 1     16.5   RCHRES  23    INFLOW ISED   2
PERLND  17 SEDMNT SOSED  1 1     14.9   RCHRES  23    INFLOW ISED   3
PERLND  18 SEDMNT SOSED  1 1      1.2   RCHRES  24    INFLOW ISED   1
PERLND  18 SEDMNT SOSED  1 1     12.0   RCHRES  24    INFLOW ISED   2
PERLND  18 SEDMNT SOSED  1 1     10.8   RCHRES  24    INFLOW ISED   3
PERLND  19 SEDMNT SOSED  1 1     11.7   RCHRES  25    INFLOW ISED   1
PERLND  19 SEDMNT SOSED  1 1      0.7   RCHRES  25    INFLOW ISED   2
PERLND  19 SEDMNT SOSED  1 1      0.6   RCHRES  25    INFLOW ISED   3
PERLND  20 SEDMNT SOSED  1 1     27.0   RCHRES  26    INFLOW ISED   1
PERLND  20 SEDMNT SOSED  1 1      1.5   RCHRES  26    INFLOW ISED   2
PERLND  20 SEDMNT SOSED  1 1      1.5   RCHRES  26    INFLOW ISED   3
PERLND  21 SEDMNT SOSED  1 1      1.0   RCHRES  27    INFLOW ISED   1
PERLND  21 SEDMNT SOSED  1 1      9.6   RCHRES  27    INFLOW ISED   2
PERLND  21 SEDMNT SOSED  1 1      8.6   RCHRES  27    INFLOW ISED   3
RCHRES   1 SEDTRN OSED   2 4      1.0   RCHRES   4    INFLOW ISED   2
RCHRES   4 SEDTRN OSED   2 1      1.0   RCHRES   6    INFLOW ISED   1
RCHRES   4 SEDTRN OSED   2 2      1.0   RCHRES   6    INFLOW ISED   2
RCHRES   4 SEDTRN OSED   2 3      1.0   RCHRES   6    INFLOW ISED   3
RCHRES   2 SEDTRN OSED   2 1      1.0   RCHRES   3    INFLOW ISED   1
RCHRES   2 SEDTRN OSED   2 2      1.0   RCHRES   3    INFLOW ISED   2
RCHRES   2 SEDTRN OSED   2 3      1.0   RCHRES   3    INFLOW ISED   3
RCHRES   3 SEDTRN OSED   2 1      1.0   RCHRES   5    INFLOW ISED   1
RCHRES   3 SEDTRN OSED   2 2      1.0   RCHRES   5    INFLOW ISED   2
RCHRES   3 SEDTRN OSED   2 3      1.0   RCHRES   5    INFLOW ISED   3
RCHRES   5 SEDTRN OSED   2 1      1.0   RCHRES   6    INFLOW ISED   1
RCHRES   5 SEDTRN OSED   2 2      1.0   RCHRES   6    INFLOW ISED   2
RCHRES   5 SEDTRN OSED   2 3      1.0   RCHRES   6    INFLOW ISED   3
RCHRES   6 SEDTRN OSED   2 1      1.0   RCHRES   7    INFLOW ISED   1
RCHRES   6 SEDTRN OSED   2 2      1.0   RCHRES   7    INFLOW ISED   2
RCHRES   6 SEDTRN OSED   2 3      1.0   RCHRES   7    INFLOW ISED   3

RCHRES   8 SEDTRN ROSED  1        1.0   RCHRES  10    INFLOW ISED   1
RCHRES   8 SEDTRN ROSED  2       0.25   RCHRES  10    INFLOW ISED   2
RCHRES   8 SEDTRN ROSED  3       0.40   RCHRES  10    INFLOW ISED   3
RCHRES   8 SEDTRN ROSED  2       0.75   RCHRES  10    INFLOW ISED   1
RCHRES   8 SEDTRN ROSED  3       0.60   RCHRES  10    INFLOW ISED   1

RCHRES   9 SEDTRN ROSED           1.0   RCHRES  10    INFLOW ISED
RCHRES  10 SEDTRN ROSED  4        1.0   RCHRES  11    INFLOW ISED   2
RCHRES  11 SEDTRN OSED   2 1      1.0   RCHRES  27    INFLOW ISED   2
RCHRES  11 SEDTRN OSED   2 2      1.0   RCHRES  27    INFLOW ISED   2
RCHRES  11 SEDTRN OSED   2 3      1.0   RCHRES  27    INFLOW ISED   2
RCHRES  27 SEDTRN OSED   2 1      1.0   RCHRES  12    INFLOW ISED   1
RCHRES  27 SEDTRN OSED   2 2      1.0   RCHRES  12    INFLOW ISED   2
RCHRES  27 SEDTRN OSED   2 3      1.0   RCHRES  12    INFLOW ISED   3
RCHRES  12 SEDTRN ROSED  4        1.0   RCHRES  13    INFLOW ISED   2
RCHRES  13 SEDTRN OSED   2 4      1.0   RCHRES   4    INFLOW ISED   2
RCHRES  14 SEDTRN ROSED  4        1.0   RCHRES  15    INFLOW ISED   2
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RCHRES  15 SEDTRN OSED    2 1       1.0     RCHRES  16      INFLOW ISED   1
RCHRES  15 SEDTRN OSED    2 2       0.8     RCHRES  16      INFLOW ISED   1
RCHRES  15 SEDTRN OSED    2 2       0.2     RCHRES  16      INFLOW ISED   2
RCHRES  15 SEDTRN OSED    2 3       1.0     RCHRES  16      INFLOW ISED   3
RCHRES  16 SEDTRN ROSED   4         1.0     RCHRES  17      INFLOW ISED   2
RCHRES  17 SEDTRN OSED    2 1       1.0     RCHRES  23      INFLOW ISED   1
RCHRES  17 SEDTRN OSED    2 2       1.0     RCHRES  23      INFLOW ISED   2
RCHRES  17 SEDTRN OSED    2 3       1.0     RCHRES  23      INFLOW ISED   3
RCHRES  18 SEDTRN ROSED   4         1.0     RCHRES  12      INFLOW ISED   2

RCHRES  19 SEDTRN OSED    2 1       1.0     RCHRES  16      INFLOW ISED   1
RCHRES  19 SEDTRN OSED    2 2      0.50     RCHRES  16      INFLOW ISED   1
RCHRES  19 SEDTRN OSED    2 2      0.50     RCHRES  16      INFLOW ISED   2
RCHRES  19 SEDTRN OSED    2 3       1.0     RCHRES  16      INFLOW ISED   3

RCHRES  20 SEDTRN OSED    2 4       1.0     RCHRES  19      INFLOW ISED   2
RCHRES  20 SEDTRN OSED    3 4       1.0     RCHRES  24      INFLOW ISED   2
RCHRES  21 SEDTRN ROSED   4         1.0     RCHRES  22      INFLOW ISED   2
RCHRES  22 SEDTRN ROSED   4         1.0     RCHRES  14      INFLOW ISED   2
RCHRES  23 SEDTRN OSED    2 1       1.0     RCHRES  18      INFLOW ISED   1
RCHRES  23 SEDTRN OSED    2 2       1.0     RCHRES  18      INFLOW ISED   2
RCHRES  23 SEDTRN OSED    2 3       1.0     RCHRES  18      INFLOW ISED   3
RCHRES  24 SEDTRN OSED    2 4       1.0     RCHRES  23      INFLOW ISED   2
RCHRES  25 SEDTRN ROSED   4         1.0     RCHRES  26      INFLOW ISED   2
RCHRES  26 SEDTRN ROSED   4         1.0     RCHRES  10      INFLOW ISED   2

***  For contaminant transport simulation ****
IMPLND   1 IQUAL  SOQUAL 1      13200.0     RCHRES    2     INFLOW ISQAL  2 1
IMPLND   1 IQUAL  SOQUAL 2      13200.0     RCHRES    2     INFLOW ISQAL  2 2
IMPLND   1 IQUAL  SOQUAL 3      13200.0     RCHRES    2     INFLOW ISQAL  2 3
IMPLND   2 IQUAL  SOQUAL 1      96000.0     RCHRES    8     INFLOW ISQAL  2 1
IMPLND   2 IQUAL  SOQUAL 2      96000.0     RCHRES    8     INFLOW ISQAL  2 2
IMPLND   2 IQUAL  SOQUAL 3      96000.0     RCHRES    8     INFLOW ISQAL  2 3
IMPLND   3 IQUAL  SOQUAL 1       4800.0     RCHRES    9     INFLOW ISQAL  2 1
IMPLND   3 IQUAL  SOQUAL 2       4800.0     RCHRES    9     INFLOW ISQAL  2 2
IMPLND   3 IQUAL  SOQUAL 3       4800.0     RCHRES    9     INFLOW ISQAL  2 3
IMPLND   4 IQUAL  SOQUAL 1      87600.0     RCHRES   20     INFLOW ISQAL  2 1
IMPLND   4 IQUAL  SOQUAL 2      87600.0     RCHRES   20     INFLOW ISQAL  2 2
IMPLND   4 IQUAL  SOQUAL 3      87600.0     RCHRES   20     INFLOW ISQAL  2 3

PERLND   1 PQUAL  SOQS   1     233000.0     RCHRES    1     INFLOW ISQAL  2 1
PERLND   1 PQUAL  SOQS   2     233000.0     RCHRES    1     INFLOW ISQAL  2 2
PERLND   1 PQUAL  SOQS   3     233000.0     RCHRES    1     INFLOW ISQAL  2 3

PERLND   2 PQUAL  SOQS   1     120000.0     RCHRES    2     INFLOW ISQAL  2 1
PERLND   2 PQUAL  SOQS   1     120000.0     RCHRES    2     INFLOW ISQAL  3 1
PERLND   2 PQUAL  SOQS   2     120000.0     RCHRES    2     INFLOW ISQAL  2 2
PERLND   2 PQUAL  SOQS   2     120000.0     RCHRES    2     INFLOW ISQAL  3 2
PERLND   2 PQUAL  SOQS   3     120000.0     RCHRES    2     INFLOW ISQAL  2 3
PERLND   2 PQUAL  SOQS   3     120000.0     RCHRES    2     INFLOW ISQAL  3 3

PERLND   3 PQUAL  SOQS   1     137000.0     RCHRES    4     INFLOW ISQAL  2 1
PERLND   3 PQUAL  SOQS   2     137000.0     RCHRES    4     INFLOW ISQAL  2 2
PERLND   3 PQUAL  SOQS   3     137000.0     RCHRES    4     INFLOW ISQAL  2 3

PERLND   4 PQUAL  SOQS   1     196000.0     RCHRES    5     INFLOW ISQAL  2 1
PERLND   4 PQUAL  SOQS   2     196000.0     RCHRES    5     INFLOW ISQAL  2 2
PERLND   4 PQUAL  SOQS   3     196000.0     RCHRES    5     INFLOW ISQAL  2 3
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PERLND   5 PQUAL  SOQS   1    48000.0    RCHRES   6     INFLOW ISQAL  2 1
PERLND   5 PQUAL  SOQS   2    48000.0    RCHRES   6     INFLOW ISQAL  2 2
PERLND   5 PQUAL  SOQS   3    48000.0    RCHRES   6     INFLOW ISQAL  2 3

PERLND   6 PQUAL  SOQS   1   244000.0    RCHRES   7     INFLOW ISQAL  2 1
PERLND   6 PQUAL  SOQS   2   244000.0    RCHRES   7     INFLOW ISQAL  2 2
PERLND   6 PQUAL  SOQS   3   244000.0    RCHRES   7     INFLOW ISQAL  2 3

PERLND   7 PQUAL  SOQS   1   150000.0    RCHRES   8     INFLOW ISQAL  2 1
PERLND   7 PQUAL  SOQS   2   150000.0    RCHRES   8     INFLOW ISQAL  2 2
PERLND   7 PQUAL  SOQS   3   150000.0    RCHRES   8     INFLOW ISQAL  2 3

PERLND   8 PQUAL  SOQS   1     4800.0    RCHRES   9     INFLOW ISQAL  2 1
PERLND   8 PQUAL  SOQS   2     4800.0    RCHRES   9     INFLOW ISQAL  2 2
PERLND   8 PQUAL  SOQS   3     4800.0    RCHRES   9     INFLOW ISQAL  2 3

PERLND   9 PQUAL  SOQS   1    45600.0    RCHRES  10     INFLOW ISQAL  2 1
PERLND   9 PQUAL  SOQS   2    45600.0    RCHRES  10     INFLOW ISQAL  2 2
PERLND   9 PQUAL  SOQS   3    45600.0    RCHRES  10     INFLOW ISQAL  2 3

PERLND  10 PQUAL  SOQS   1    38300.0    RCHRES  12     INFLOW ISQAL  2 1
PERLND  10 PQUAL  SOQS   2    38300.0    RCHRES  12     INFLOW ISQAL  2 2
PERLND  10 PQUAL  SOQS   3    38300.0    RCHRES  12     INFLOW ISQAL  2 3

PERLND  11 PQUAL  SOQS   1    13200.0    RCHRES  14     INFLOW ISQAL  2 1
PERLND  11 PQUAL  SOQS   2    13200.0    RCHRES  14     INFLOW ISQAL  2 2
PERLND  11 PQUAL  SOQS   3    13200.0    RCHRES  14     INFLOW ISQAL  2 3

PERLND  12 PQUAL  SOQS   1    13200.0    RCHRES  16     INFLOW ISQAL  2 1
PERLND  12 PQUAL  SOQS   2    13200.0    RCHRES  16     INFLOW ISQAL  2 2
PERLND  12 PQUAL  SOQS   3    13200.0    RCHRES  16     INFLOW ISQAL  2 3

PERLND  13 PQUAL  SOQS   1    30000.0    RCHRES  18     INFLOW ISQAL  2 1
PERLND  13 PQUAL  SOQS   2    30000.0    RCHRES  18     INFLOW ISQAL  2 2
PERLND  13 PQUAL  SOQS   3    30000.0    RCHRES  18     INFLOW ISQAL  2 3

PERLND  14 PQUAL  SOQS   1    21600.0    RCHRES  20     INFLOW ISQAL  2 1
PERLND  14 PQUAL  SOQS   2    21600.0    RCHRES  20     INFLOW ISQAL  2 2
PERLND  14 PQUAL  SOQS   3    21600.0    RCHRES  20     INFLOW ISQAL  2 3

PERLND  15 PQUAL  SOQS   1    16700.0    RCHRES  21     INFLOW ISQAL  2 1
PERLND  15 PQUAL  SOQS   2    16700.0    RCHRES  21     INFLOW ISQAL  2 2
PERLND  15 PQUAL  SOQS   3    16700.0    RCHRES  21     INFLOW ISQAL  2 3

PERLND  16 PQUAL  SOQS   1     5600.0    RCHRES  22     INFLOW ISQAL  2 1
PERLND  16 PQUAL  SOQS   2     5600.0    RCHRES  22     INFLOW ISQAL  2 2
PERLND  16 PQUAL  SOQS   3     5600.0    RCHRES  22     INFLOW ISQAL  2 3

PERLND  17 PQUAL  SOQS   1    33000.0    RCHRES  23     INFLOW ISQAL  2 1
PERLND  17 PQUAL  SOQS   2    33000.0    RCHRES  23     INFLOW ISQAL  2 2
PERLND  17 PQUAL  SOQS   3    33000.0    RCHRES  23     INFLOW ISQAL  2 3

PERLND  18 PQUAL  SOQS   1    24000.0    RCHRES  24     INFLOW ISQAL  2 1
PERLND  18 PQUAL  SOQS   2    24000.0    RCHRES  24     INFLOW ISQAL  2 2
PERLND  18 PQUAL  SOQS   3    24000.0    RCHRES  24     INFLOW ISQAL  2 3

PERLND  19 PQUAL  SOQS   1    13000.0    RCHRES  25     INFLOW ISQAL  2 1
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PERLND  19 PQUAL  SOQS   2      13000.0    RCHRES  25    INFLOW ISQAL  2 2
PERLND  19 PQUAL  SOQS   3      13000.0    RCHRES  25    INFLOW ISQAL  2 3

PERLND  20 PQUAL  SOQS   1      30000.0    RCHRES  26    INFLOW ISQAL  2 1
PERLND  20 PQUAL  SOQS   2      30000.0    RCHRES  26    INFLOW ISQAL  2 2
PERLND  20 PQUAL  SOQS   3      30000.0    RCHRES  26    INFLOW ISQAL  2 3

PERLND  21 PQUAL  SOQS   1      19200.0    RCHRES  27    INFLOW ISQAL  2 1
PERLND  21 PQUAL  SOQS   2      19200.0    RCHRES  27    INFLOW ISQAL  2 2
PERLND  21 PQUAL  SOQS   3      19200.0    RCHRES  27    INFLOW ISQAL  2 3

RCHRES   1 GQUAL  OSQAL  2 2        1.0    RCHRES   4    INFLOW ISQAL  2 1
RCHRES   1 GQUAL  OSQAL  2 5        1.0    RCHRES   4    INFLOW ISQAL  2 2
RCHRES   1 GQUAL  OSQAL  2 8        1.0    RCHRES   4    INFLOW ISQAL  2 3

RCHRES   2 GQUAL  OSQAL  2 1        1.0    RCHRES   3    INFLOW ISQAL  1 1
RCHRES   2 GQUAL  OSQAL  2 2        1.0    RCHRES   3    INFLOW ISQAL  2 2
RCHRES   2 GQUAL  OSQAL  2 3        1.0    RCHRES   3    INFLOW ISQAL  3 3
RCHRES   2 GQUAL  OSQAL  2 4        1.0    RCHRES   3    INFLOW ISQAL  1 1
RCHRES   2 GQUAL  OSQAL  2 5        1.0    RCHRES   3    INFLOW ISQAL  2 2
RCHRES   2 GQUAL  OSQAL  2 6        1.0    RCHRES   3    INFLOW ISQAL  3 3
RCHRES   2 GQUAL  OSQAL  2 7        1.0    RCHRES   3    INFLOW ISQAL  1 1
RCHRES   2 GQUAL  OSQAL  2 8        1.0    RCHRES   3    INFLOW ISQAL  2 2
RCHRES   2 GQUAL  OSQAL  2 9        1.0    RCHRES   3    INFLOW ISQAL  3 3

RCHRES   3 GQUAL  OSQAL  2 1        1.0    RCHRES   5    INFLOW ISQAL  1 1
RCHRES   3 GQUAL  OSQAL  2 2        1.0    RCHRES   5    INFLOW ISQAL  2 2
RCHRES   3 GQUAL  OSQAL  2 3        1.0    RCHRES   5    INFLOW ISQAL  3 3
RCHRES   3 GQUAL  OSQAL  2 4        1.0    RCHRES   5    INFLOW ISQAL  1 1
RCHRES   3 GQUAL  OSQAL  2 5        1.0    RCHRES   5    INFLOW ISQAL  2 2
RCHRES   3 GQUAL  OSQAL  2 6        1.0    RCHRES   5    INFLOW ISQAL  3 3
RCHRES   3 GQUAL  OSQAL  2 7        1.0    RCHRES   5    INFLOW ISQAL  1 1
RCHRES   3 GQUAL  OSQAL  2 8        1.0    RCHRES   5    INFLOW ISQAL  2 2
RCHRES   3 GQUAL  OSQAL  2 9        1.0    RCHRES   5    INFLOW ISQAL  3 3

RCHRES   4 GQUAL  OSQAL  2 1        1.0    RCHRES   6    INFLOW ISQAL  1 1
RCHRES   4 GQUAL  OSQAL  2 2        1.0    RCHRES   6    INFLOW ISQAL  2 2
RCHRES   4 GQUAL  OSQAL  2 3        1.0    RCHRES   6    INFLOW ISQAL  3 3
RCHRES   4 GQUAL  OSQAL  2 4        1.0    RCHRES   6    INFLOW ISQAL  1 1
RCHRES   4 GQUAL  OSQAL  2 5        1.0    RCHRES   6    INFLOW ISQAL  2 2
RCHRES   4 GQUAL  OSQAL  2 6        1.0    RCHRES   6    INFLOW ISQAL  3 3
RCHRES   4 GQUAL  OSQAL  2 7        1.0    RCHRES   6    INFLOW ISQAL  1 1
RCHRES   4 GQUAL  OSQAL  2 8        1.0    RCHRES   6    INFLOW ISQAL  2 2
RCHRES   4 GQUAL  OSQAL  2 9        1.0    RCHRES   6    INFLOW ISQAL  3 3

RCHRES   5 GQUAL  OSQAL  2 1        1.0    RCHRES   6    INFLOW ISQAL  1 1
RCHRES   5 GQUAL  OSQAL  2 2        1.0    RCHRES   6    INFLOW ISQAL  2 2
RCHRES   5 GQUAL  OSQAL  2 3        1.0    RCHRES   6    INFLOW ISQAL  3 3
RCHRES   5 GQUAL  OSQAL  2 4        1.0    RCHRES   6    INFLOW ISQAL  1 1
RCHRES   5 GQUAL  OSQAL  2 5        1.0    RCHRES   6    INFLOW ISQAL  2 2
RCHRES   5 GQUAL  OSQAL  2 6        1.0    RCHRES   6    INFLOW ISQAL  3 3
RCHRES   5 GQUAL  OSQAL  2 7        1.0    RCHRES   6    INFLOW ISQAL  1 1
RCHRES   5 GQUAL  OSQAL  2 8        1.0    RCHRES   6    INFLOW ISQAL  2 2
RCHRES   5 GQUAL  OSQAL  2 9        1.0    RCHRES   6    INFLOW ISQAL  3 3

RCHRES   6 GQUAL  OSQAL  2 1        1.0    RCHRES   7    INFLOW ISQAL  1 1
RCHRES   6 GQUAL  OSQAL  2 2        1.0    RCHRES   7    INFLOW ISQAL  2 1
RCHRES   6 GQUAL  OSQAL  2 3        1.0    RCHRES   7    INFLOW ISQAL  3 1
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RCHRES    6 GQUAL   OSQAL   2 4        1.0      RCHRES    7       INFLOW ISQAL  1 2
RCHRES    6 GQUAL   OSQAL   2 5        1.0      RCHRES    7       INFLOW ISQAL  2 2
RCHRES    6 GQUAL   OSQAL   2 6        1.0      RCHRES    7       INFLOW ISQAL  3 2
RCHRES    6 GQUAL   OSQAL   2 7        1.0      RCHRES    7       INFLOW ISQAL  1 3
RCHRES    6 GQUAL   OSQAL   2 8        1.0      RCHRES    7       INFLOW ISQAL  2 3
RCHRES    6 GQUAL   OSQAL   2 9        1.0      RCHRES    7       INFLOW ISQAL  3 3

RCHRES    8 GQUAL   ROSQAL 4 1         1.0      RCHRES   10       INFLOW ISQAL  2 1
RCHRES    8 GQUAL   ROSQAL 4 2         1.0      RCHRES   10       INFLOW ISQAL  2 2
RCHRES    8 GQUAL   ROSQAL 4 3         1.0      RCHRES   10       INFLOW ISQAL  2 3

RCHRES    9 GQUAL   ROSQAL 4 1         1.0      RCHRES   10       INFLOW ISQAL  2 1
RCHRES    9 GQUAL   ROSQAL 4 2         1.0      RCHRES   10       INFLOW ISQAL  2 2
RCHRES    9 GQUAL   ROSQAL 4 3         1.0      RCHRES   10       INFLOW ISQAL  2 3

RCHRES   10 GQUAL   ROSQAL 4 1         1.0      RCHRES   11       INFLOW ISQAL  2 1
RCHRES   10 GQUAL   ROSQAL 4 2         1.0      RCHRES   11       INFLOW ISQAL  2 2
RCHRES   10 GQUAL   ROSQAL 4 3         1.0      RCHRES   11       INFLOW ISQAL  2 3

RCHRES   11 GQUAL   OSQAL   2 1        1.0      RCHRES   27       INFLOW ISQAL  2 1
RCHRES   11 GQUAL   OSQAL   2 2        1.0      RCHRES   27       INFLOW ISQAL  2 1
RCHRES   11 GQUAL   OSQAL   2 3        1.0      RCHRES   27       INFLOW ISQAL  2 1
RCHRES   11 GQUAL   OSQAL   2 4        1.0      RCHRES   27       INFLOW ISQAL  2 2
RCHRES   11 GQUAL   OSQAL   2 5        1.0      RCHRES   27       INFLOW ISQAL  2 2
RCHRES   11 GQUAL   OSQAL   2 6        1.0      RCHRES   27       INFLOW ISQAL  2 2
RCHRES   11 GQUAL   OSQAL   2 7        1.0      RCHRES   27       INFLOW ISQAL  2 3
RCHRES   11 GQUAL   OSQAL   2 8        1.0      RCHRES   27       INFLOW ISQAL  2 3
RCHRES   11 GQUAL   OSQAL   2 9        1.0      RCHRES   27       INFLOW ISQAL  2 3

RCHRES   27 GQUAL   OSQAL   2 1        1.0      RCHRES   12       INFLOW ISQAL  1 1
RCHRES   27 GQUAL   OSQAL   2 2        1.0      RCHRES   12       INFLOW ISQAL  2 1
RCHRES   27 GQUAL   OSQAL   2 3        1.0      RCHRES   12       INFLOW ISQAL  3 1
RCHRES   27 GQUAL   OSQAL   2 4        1.0      RCHRES   12       INFLOW ISQAL  1 2
RCHRES   27 GQUAL   OSQAL   2 5        1.0      RCHRES   12       INFLOW ISQAL  2 2
RCHRES   27 GQUAL   OSQAL   2 6        1.0      RCHRES   12       INFLOW ISQAL  3 2
RCHRES   27 GQUAL   OSQAL   2 7        1.0      RCHRES   12       INFLOW ISQAL  1 3
RCHRES   27 GQUAL   OSQAL   2 8        1.0      RCHRES   12       INFLOW ISQAL  2 3
RCHRES   27 GQUAL   OSQAL   2 9        1.0      RCHRES   12       INFLOW ISQAL  3 3

RCHRES   12 GQUAL   ROSQAL 4 1         1.0      RCHRES   13       INFLOW ISQAL  2 1
RCHRES   12 GQUAL   ROSQAL 4 2         1.0      RCHRES   13       INFLOW ISQAL  2 2
RCHRES   12 GQUAL   ROSQAL 4 3         1.0      RCHRES   13       INFLOW ISQAL  2 3

RCHRES   13 GQUAL   OSQAL   2 2        1.0      RCHRES    4       INFLOW ISQAL  2 1
RCHRES   13 GQUAL   OSQAL   2 5        1.0      RCHRES    4       INFLOW ISQAL  2 2
RCHRES   13 GQUAL   OSQAL   2 8        1.0      RCHRES    4       INFLOW ISQAL  2 3

RCHRES   14 GQUAL   ROSQAL 4 1         1.0      RCHRES   15       INFLOW ISQAL  2 1
RCHRES   14 GQUAL   ROSQAL 4 2         1.0      RCHRES   15       INFLOW ISQAL  2 2
RCHRES   14 GQUAL   ROSQAL 4 3         1.0      RCHRES   15       INFLOW ISQAL  2 3

RCHRES   15 GQUAL   OSQAL   2 1        1.0      RCHRES   16       INFLOW ISQAL  1 1
RCHRES   15 GQUAL   OSQAL   2 2        1.0      RCHRES   16       INFLOW ISQAL  2 1
RCHRES   15 GQUAL   OSQAL   2 3        1.0      RCHRES   16       INFLOW ISQAL  3 1
RCHRES   15 GQUAL   OSQAL   2 4        1.0      RCHRES   16       INFLOW ISQAL  1 2
RCHRES   15 GQUAL   OSQAL   2 5        1.0      RCHRES   16       INFLOW ISQAL  2 2
RCHRES   15 GQUAL   OSQAL   2 6        1.0      RCHRES   16       INFLOW ISQAL  3 2
RCHRES   15 GQUAL   OSQAL   2 7        1.0      RCHRES   16       INFLOW ISQAL  1 3
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RCHRES  15 GQUAL  OSQAL  2 8      1.0    RCHRES  16     INFLOW ISQAL  2 3
RCHRES  15 GQUAL  OSQAL  2 9      1.0    RCHRES  16     INFLOW ISQAL  3 3

RCHRES  16 GQUAL  ROSQAL 4 1      1.0    RCHRES  17     INFLOW ISQAL  2 1
RCHRES  16 GQUAL  ROSQAL 4 2      1.0    RCHRES  17     INFLOW ISQAL  2 2
RCHRES  16 GQUAL  ROSQAL 4 3      1.0    RCHRES  17     INFLOW ISQAL  2 3

RCHRES  17 GQUAL  OSQAL  2 1      1.0    RCHRES  23     INFLOW ISQAL  1 1
RCHRES  17 GQUAL  OSQAL  2 2      1.0    RCHRES  23     INFLOW ISQAL  2 1
RCHRES  17 GQUAL  OSQAL  2 3      1.0    RCHRES  23     INFLOW ISQAL  3 1
RCHRES  17 GQUAL  OSQAL  2 4      1.0    RCHRES  23     INFLOW ISQAL  1 2
RCHRES  17 GQUAL  OSQAL  2 5      1.0    RCHRES  23     INFLOW ISQAL  2 2
RCHRES  17 GQUAL  OSQAL  2 6      1.0    RCHRES  23     INFLOW ISQAL  3 2
RCHRES  17 GQUAL  OSQAL  2 7      1.0    RCHRES  23     INFLOW ISQAL  1 3
RCHRES  17 GQUAL  OSQAL  2 8      1.0    RCHRES  23     INFLOW ISQAL  2 3
RCHRES  17 GQUAL  OSQAL  2 9      1.0    RCHRES  23     INFLOW ISQAL  3 3

RCHRES  18 GQUAL  ROSQAL 4 1      1.0    RCHRES  12     INFLOW ISQAL  2 1
RCHRES  18 GQUAL  ROSQAL 4 2      1.0    RCHRES  12     INFLOW ISQAL  2 2
RCHRES  18 GQUAL  ROSQAL 4 3      1.0    RCHRES  12     INFLOW ISQAL  2 3

RCHRES  19 GQUAL  OSQAL  2 1      1.0    RCHRES  16     INFLOW ISQAL  1 1
RCHRES  19 GQUAL  OSQAL  2 2      1.0    RCHRES  16     INFLOW ISQAL  2 1
RCHRES  19 GQUAL  OSQAL  2 3      1.0    RCHRES  16     INFLOW ISQAL  3 1
RCHRES  19 GQUAL  OSQAL  2 4      1.0    RCHRES  16     INFLOW ISQAL  1 2
RCHRES  19 GQUAL  OSQAL  2 5      1.0    RCHRES  16     INFLOW ISQAL  2 2
RCHRES  19 GQUAL  OSQAL  2 6      1.0    RCHRES  16     INFLOW ISQAL  3 2
RCHRES  19 GQUAL  OSQAL  2 7      1.0    RCHRES  16     INFLOW ISQAL  1 3
RCHRES  19 GQUAL  OSQAL  2 8      1.0    RCHRES  16     INFLOW ISQAL  2 3
RCHRES  19 GQUAL  OSQAL  2 9      1.0    RCHRES  16     INFLOW ISQAL  3 3

RCHRES  20 GQUAL  OSQAL  2 2      1.0    RCHRES  19     INFLOW ISQAL  2 1
RCHRES  20 GQUAL  OSQAL  2 5      1.0    RCHRES  19     INFLOW ISQAL  2 2
RCHRES  20 GQUAL  OSQAL  2 8      1.0    RCHRES  19     INFLOW ISQAL  2 3

RCHRES  20 GQUAL  OSQAL  3 2      1.0    RCHRES  24     INFLOW ISQAL  2 1
RCHRES  20 GQUAL  OSQAL  3 5      1.0    RCHRES  24     INFLOW ISQAL  2 2
RCHRES  20 GQUAL  OSQAL  3 8      1.0    RCHRES  24     INFLOW ISQAL  2 3

RCHRES  21 GQUAL  ROSQAL 4 1      1.0    RCHRES  22     INFLOW ISQAL  2 1
RCHRES  21 GQUAL  ROSQAL 4 2      1.0    RCHRES  22     INFLOW ISQAL  2 2
RCHRES  21 GQUAL  ROSQAL 4 3      1.0    RCHRES  22     INFLOW ISQAL  2 3

RCHRES  22 GQUAL  ROSQAL 4 1      1.0    RCHRES  14     INFLOW ISQAL  2 1
RCHRES  22 GQUAL  ROSQAL 4 2      1.0    RCHRES  14     INFLOW ISQAL  2 2
RCHRES  22 GQUAL  ROSQAL 4 3      1.0    RCHRES  14     INFLOW ISQAL  2 3

RCHRES  23 GQUAL  OSQAL  2 1      1.0    RCHRES  18     INFLOW ISQAL  1 1
RCHRES  23 GQUAL  OSQAL  2 2      1.0    RCHRES  18     INFLOW ISQAL  2 1
RCHRES  23 GQUAL  OSQAL  2 3      1.0    RCHRES  18     INFLOW ISQAL  3 1
RCHRES  23 GQUAL  OSQAL  2 4      1.0    RCHRES  18     INFLOW ISQAL  1 2
RCHRES  23 GQUAL  OSQAL  2 5      1.0    RCHRES  18     INFLOW ISQAL  2 2
RCHRES  23 GQUAL  OSQAL  2 6      1.0    RCHRES  18     INFLOW ISQAL  3 2
RCHRES  23 GQUAL  OSQAL  2 7      1.0    RCHRES  18     INFLOW ISQAL  1 3
RCHRES  23 GQUAL  OSQAL  2 8      1.0    RCHRES  18     INFLOW ISQAL  2 3
RCHRES  23 GQUAL  OSQAL  2 9      1.0    RCHRES  18     INFLOW ISQAL  3 3

RCHRES  24 GQUAL  OSQAL  2 2      1.0    RCHRES  23     INFLOW ISQAL  2 1
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RCHRES  24 GQUAL  OSQAL  2 5       1.0      RCHRES  23     INFLOW ISQAL  2 2
RCHRES  24 GQUAL  OSQAL  2 8       1.0      RCHRES  23     INFLOW ISQAL  2 3

RCHRES  25 GQUAL  ROSQAL 4 1       1.0      RCHRES  26     INFLOW ISQAL  2 1
RCHRES  25 GQUAL  ROSQAL 4 2       1.0      RCHRES  26     INFLOW ISQAL  2 2
RCHRES  25 GQUAL  ROSQAL 4 3       1.0      RCHRES  26     INFLOW ISQAL  2 3

RCHRES  26 GQUAL  ROSQAL 4 1       1.0      RCHRES  10     INFLOW ISQAL  2 1
RCHRES  26 GQUAL  ROSQAL 4 2       1.0      RCHRES  10     INFLOW ISQAL  2 2
RCHRES  26 GQUAL  ROSQAL 4 3       1.0      RCHRES  10     INFLOW ISQAL  2 3

*****   Conversions for flow from PERLND and IMPLND to RCHRES:
*****      #of acres (to convert in/hr to cfs like below)
*****      is divided by 12 to get ac-ft/hour
*** Simulated scour at selected locations ***
**** Water quality output for GS03 ***
RCHRES  07 SEDTRN DEPSCR 4 1       1.0      PLTGEN   1     INPUT  MEAN   1
RCHRES  07 GQUAL  DSQAL  4 1       1.0      PLTGEN   1     INPUT  MEAN   2
RCHRES  07 GQUAL  DSQAL  4 2       1.0      PLTGEN   1     INPUT  MEAN   3
RCHRES  07 GQUAL  DSQAL  4 3       1.0      PLTGEN   1     INPUT  MEAN   4
RCHRES  07 SEDTRN SSED   1 1       1.0      PLTGEN   1     INPUT  MEAN   5
RCHRES  07 SEDTRN SSED   2 1       1.0      PLTGEN   1     INPUT  MEAN   6
RCHRES  07 SEDTRN SSED   3 1       1.0      PLTGEN   1     INPUT  MEAN   7
RCHRES  07 GQUAL  SQAL   1 1       1.0      PLTGEN   1     INPUT  MEAN   8
RCHRES  07 GQUAL  SQAL   2 1       1.0      PLTGEN   1     INPUT  MEAN   9
RCHRES  07 GQUAL  SQAL   3 1       1.0      PLTGEN   1     INPUT  MEAN  10
*** Water quality output for pond A-1 ***
RCHRES  07 SEDTRN SSED   1 1       1.0      PLTGEN   2     INPUT  MEAN   1
RCHRES  07 SEDTRN SSED   2 1       1.0      PLTGEN   2     INPUT  MEAN   2
RCHRES  07 SEDTRN SSED   3 1       1.0      PLTGEN   2     INPUT  MEAN   3
RCHRES  07 GQUAL  SQAL   1 2       1.0      PLTGEN   2     INPUT  MEAN   4
RCHRES  07 GQUAL  SQAL   2 2       1.0      PLTGEN   2     INPUT  MEAN   5
RCHRES  07 GQUAL  SQAL   3 2       1.0      PLTGEN   2     INPUT  MEAN   6
RCHRES  07 GQUAL  SQAL   1 3       1.0      PLTGEN   2     INPUT  MEAN   7
RCHRES  07 GQUAL  SQAL   2 3       1.0      PLTGEN   2     INPUT  MEAN   8
RCHRES  07 GQUAL  SQAL   3 3       1.0      PLTGEN   2     INPUT  MEAN   9
RCHRES  07 HYDR   ROVOL  1 1       0.5      PLTGEN   2     INPUT  MEAN  10
*** Water quality output for pond A-1 ***
RCHRES  25 SEDTRN DEPSCR 4 1       1.0      PLTGEN   3     INPUT  MEAN   1
RCHRES  25 GQUAL  DSQAL  4 1       1.0      PLTGEN   3     INPUT  MEAN   2
RCHRES  25 GQUAL  DSQAL  4 2       1.0      PLTGEN   3     INPUT  MEAN   3
RCHRES  25 GQUAL  DSQAL  4 3       1.0      PLTGEN   3     INPUT  MEAN   4
RCHRES  25 SEDTRN SSED   1 1       1.0      PLTGEN   3     INPUT  MEAN   5
RCHRES  25 SEDTRN SSED   2 1       1.0      PLTGEN   3     INPUT  MEAN   6
RCHRES  25 SEDTRN SSED   3 1       1.0      PLTGEN   3     INPUT  MEAN   7
RCHRES  25 GQUAL  SQAL   1 1       1.0      PLTGEN   3     INPUT  MEAN   8
RCHRES  25 GQUAL  SQAL   2 1       1.0      PLTGEN   3     INPUT  MEAN   9
RCHRES  25 GQUAL  SQAL   3 1       1.0      PLTGEN   3     INPUT  MEAN  10
*** Water quality output for pond A-1 ***
RCHRES  25 SEDTRN SSED   1 1       1.0      PLTGEN   4     INPUT  MEAN   1
RCHRES  25 SEDTRN SSED   2 1       1.0      PLTGEN   4     INPUT  MEAN   2
RCHRES  25 SEDTRN SSED   3 1       1.0      PLTGEN   4     INPUT  MEAN   3
RCHRES  25 GQUAL  SQAL   1 2       1.0      PLTGEN   4     INPUT  MEAN   4
RCHRES  25 GQUAL  SQAL   2 2       1.0      PLTGEN   4     INPUT  MEAN   5
RCHRES  25 GQUAL  SQAL   3 2       1.0      PLTGEN   4     INPUT  MEAN   6
RCHRES  25 GQUAL  SQAL   1 3       1.0      PLTGEN   4     INPUT  MEAN   7
RCHRES  25 GQUAL  SQAL   2 3       1.0      PLTGEN   4     INPUT  MEAN   8
RCHRES  25 GQUAL  SQAL   3 3       1.0      PLTGEN   4     INPUT  MEAN   9
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RCHRES  25 HYDR   ROVOL  1 1     0.5   PLTGEN  4    INPUT  MEAN  10
*** Water quality output for pond A-2 ***
RCHRES  26 SEDTRN DEPSCR 4 1     1.0   PLTGEN  5    INPUT  MEAN   1
RCHRES  26 GQUAL  DSQAL  4 1     1.0   PLTGEN  5    INPUT  MEAN   2
RCHRES  26 GQUAL  DSQAL  4 2     1.0   PLTGEN  5    INPUT  MEAN   3
RCHRES  26 GQUAL  DSQAL  4 3     1.0   PLTGEN  5    INPUT  MEAN   4
RCHRES  26 SEDTRN SSED   1 1     1.0   PLTGEN  5    INPUT  MEAN   5
RCHRES  26 SEDTRN SSED   2 1     1.0   PLTGEN  5    INPUT  MEAN   6
RCHRES  26 SEDTRN SSED   3 1     1.0   PLTGEN  5    INPUT  MEAN   7
RCHRES  26 GQUAL  SQAL   1 1     1.0   PLTGEN  5    INPUT  MEAN   8
RCHRES  26 GQUAL  SQAL   2 1     1.0   PLTGEN  5    INPUT  MEAN   9
RCHRES  26 GQUAL  SQAL   3 1     1.0   PLTGEN  5    INPUT  MEAN  10
*** Water quality output for pond A-2 ***
RCHRES  26 SEDTRN SSED   1 1     1.0   PLTGEN  6    INPUT  MEAN   1
RCHRES  26 SEDTRN SSED   2 1     1.0   PLTGEN  6    INPUT  MEAN   2
RCHRES  26 SEDTRN SSED   3 1     1.0   PLTGEN  6    INPUT  MEAN   3
RCHRES  26 GQUAL  SQAL   1 2     1.0   PLTGEN  6    INPUT  MEAN   4
RCHRES  26 GQUAL  SQAL   2 2     1.0   PLTGEN  6    INPUT  MEAN   5
RCHRES  26 GQUAL  SQAL   3 2     1.0   PLTGEN  6    INPUT  MEAN   6
RCHRES  26 GQUAL  SQAL   1 3     1.0   PLTGEN  6    INPUT  MEAN   7
RCHRES  26 GQUAL  SQAL   2 3     1.0   PLTGEN  6    INPUT  MEAN   8
RCHRES  26 GQUAL  SQAL   3 3     1.0   PLTGEN  6    INPUT  MEAN   9
RCHRES  26 HYDR   ROVOL  1 1     0.5   PLTGEN  6    INPUT  MEAN  10
*** Water quality output for pond A-3 ***
RCHRES  10 SEDTRN DEPSCR 4 1     1.0   PLTGEN  7    INPUT  MEAN   1
RCHRES  10 GQUAL  DSQAL  4 1     1.0   PLTGEN  7    INPUT  MEAN   2
RCHRES  10 GQUAL  DSQAL  4 2     1.0   PLTGEN  7    INPUT  MEAN   3
RCHRES  10 GQUAL  DSQAL  4 3     1.0   PLTGEN  7    INPUT  MEAN   4
RCHRES  10 SEDTRN SSED   1 1     1.0   PLTGEN  7    INPUT  MEAN   5
RCHRES  10 SEDTRN SSED   2 1     1.0   PLTGEN  7    INPUT  MEAN   6
RCHRES  10 SEDTRN SSED   3 1     1.0   PLTGEN  7    INPUT  MEAN   7
RCHRES  10 GQUAL  SQAL   1 1     1.0   PLTGEN  7    INPUT  MEAN   8
RCHRES  10 GQUAL  SQAL   2 1     1.0   PLTGEN  7    INPUT  MEAN   9
RCHRES  10 GQUAL  SQAL   3 1     1.0   PLTGEN  7    INPUT  MEAN  10
*** Water quality output for pond A-3 ***
RCHRES  10 SEDTRN SSED   1 1     1.0   PLTGEN  8    INPUT  MEAN   1
RCHRES  10 SEDTRN SSED   2 1     1.0   PLTGEN  8    INPUT  MEAN   2
RCHRES  10 SEDTRN SSED   3 1     1.0   PLTGEN  8    INPUT  MEAN   3
RCHRES  10 GQUAL  SQAL   1 2     1.0   PLTGEN  8    INPUT  MEAN   4
RCHRES  10 GQUAL  SQAL   2 2     1.0   PLTGEN  8    INPUT  MEAN   5
RCHRES  10 GQUAL  SQAL   3 2     1.0   PLTGEN  8    INPUT  MEAN   6
RCHRES  10 GQUAL  SQAL   1 3     1.0   PLTGEN  8    INPUT  MEAN   7
RCHRES  10 GQUAL  SQAL   2 3     1.0   PLTGEN  8    INPUT  MEAN   8
RCHRES  10 GQUAL  SQAL   3 3     1.0   PLTGEN  8    INPUT  MEAN   9
RCHRES  10 HYDR   ROVOL  1 1     0.5   PLTGEN  8    INPUT  MEAN  10
*** Water quality output for pond A-4 ***
RCHRES  12 SEDTRN DEPSCR 4 1     1.0   PLTGEN  9    INPUT  MEAN   1
RCHRES  12 GQUAL  DSQAL  4 1     1.0   PLTGEN  9    INPUT  MEAN   2
RCHRES  12 GQUAL  DSQAL  4 2     1.0   PLTGEN  9    INPUT  MEAN   3
RCHRES  12 GQUAL  DSQAL  4 3     1.0   PLTGEN  9    INPUT  MEAN   4
RCHRES  12 SEDTRN SSED   1 1     1.0   PLTGEN  9    INPUT  MEAN   5
RCHRES  12 SEDTRN SSED   2 1     1.0   PLTGEN  9    INPUT  MEAN   6
RCHRES  12 SEDTRN SSED   3 1     1.0   PLTGEN  9    INPUT  MEAN   7
RCHRES  12 GQUAL  SQAL   1 1     1.0   PLTGEN  9    INPUT  MEAN   8
RCHRES  12 GQUAL  SQAL   2 1     1.0   PLTGEN  9    INPUT  MEAN   9
RCHRES  12 GQUAL  SQAL   3 1     1.0   PLTGEN  9    INPUT  MEAN  10
*** Water quality output for pond A-4 ***
RCHRES  12 SEDTRN SSED   1 1     1.0   PLTGEN 10    INPUT  MEAN   1
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RCHRES   12 SEDTRN SSED    2 1         1.0      PLTGEN  10      INPUT  MEAN    2
RCHRES   12 SEDTRN SSED    3 1         1.0      PLTGEN  10      INPUT  MEAN    3
RCHRES   12 GQUAL  SQAL    1 2         1.0      PLTGEN  10      INPUT  MEAN    4
RCHRES   12 GQUAL  SQAL    2 2         1.0      PLTGEN  10      INPUT  MEAN    5
RCHRES   12 GQUAL  SQAL    3 2         1.0      PLTGEN  10      INPUT  MEAN    6
RCHRES   12 GQUAL  SQAL    1 3         1.0      PLTGEN  10      INPUT  MEAN    7
RCHRES   12 GQUAL  SQAL    2 3         1.0      PLTGEN  10      INPUT  MEAN    8
RCHRES   12 GQUAL  SQAL    3 3         1.0      PLTGEN  10      INPUT  MEAN    9
RCHRES   12 HYDR   ROVOL   1 1         0.5      PLTGEN  10      INPUT  MEAN   10
*** Water quality output for pond B-1 ***
RCHRES   21 SEDTRN DEPSCR  4 1         1.0      PLTGEN  11      INPUT  MEAN    1
RCHRES   21 GQUAL  DSQAL   4 1         1.0      PLTGEN  11      INPUT  MEAN    2
RCHRES   21 GQUAL  DSQAL   4 2         1.0      PLTGEN  11      INPUT  MEAN    3
RCHRES   21 GQUAL  DSQAL   4 3         1.0      PLTGEN  11      INPUT  MEAN    4
RCHRES   21 SEDTRN SSED    1 1         1.0      PLTGEN  11      INPUT  MEAN    5
RCHRES   21 SEDTRN SSED    2 1         1.0      PLTGEN  11      INPUT  MEAN    6
RCHRES   21 SEDTRN SSED    3 1         1.0      PLTGEN  11      INPUT  MEAN    7
RCHRES   21 GQUAL  SQAL    1 1         1.0      PLTGEN  11      INPUT  MEAN    8
RCHRES   21 GQUAL  SQAL    2 1         1.0      PLTGEN  11      INPUT  MEAN    9
RCHRES   21 GQUAL  SQAL    3 1         1.0      PLTGEN  11      INPUT  MEAN   10
*** Water quality output for pond B-1 ***
RCHRES   21 SEDTRN SSED    1 1         1.0      PLTGEN  12      INPUT  MEAN    1
RCHRES   21 SEDTRN SSED    2 1         1.0      PLTGEN  12      INPUT  MEAN    2
RCHRES   21 SEDTRN SSED    3 1         1.0      PLTGEN  12      INPUT  MEAN    3
RCHRES   21 GQUAL  SQAL    1 2         1.0      PLTGEN  12      INPUT  MEAN    4
RCHRES   21 GQUAL  SQAL    2 2         1.0      PLTGEN  12      INPUT  MEAN    5
RCHRES   21 GQUAL  SQAL    3 2         1.0      PLTGEN  12      INPUT  MEAN    6
RCHRES   21 GQUAL  SQAL    1 3         1.0      PLTGEN  12      INPUT  MEAN    7
RCHRES   21 GQUAL  SQAL    2 3         1.0      PLTGEN  12      INPUT  MEAN    8
RCHRES   21 GQUAL  SQAL    3 3         1.0      PLTGEN  12      INPUT  MEAN    9
RCHRES   21 HYDR   ROVOL   1 1         0.5      PLTGEN  12      INPUT  MEAN   10
*** Water quality output for pond B-2 ***
RCHRES   22 SEDTRN DEPSCR  4 1         1.0      PLTGEN  13      INPUT  MEAN    1
RCHRES   22 GQUAL  DSQAL   4 1         1.0      PLTGEN  13      INPUT  MEAN    2
RCHRES   22 GQUAL  DSQAL   4 2         1.0      PLTGEN  13      INPUT  MEAN    3
RCHRES   22 GQUAL  DSQAL   4 3         1.0      PLTGEN  13      INPUT  MEAN    4
RCHRES   22 SEDTRN SSED    1 1         1.0      PLTGEN  13      INPUT  MEAN    5
RCHRES   22 SEDTRN SSED    2 1         1.0      PLTGEN  13      INPUT  MEAN    6
RCHRES   22 SEDTRN SSED    3 1         1.0      PLTGEN  13      INPUT  MEAN    7
RCHRES   22 GQUAL  SQAL    1 1         1.0      PLTGEN  13      INPUT  MEAN    8
RCHRES   22 GQUAL  SQAL    2 1         1.0      PLTGEN  13      INPUT  MEAN    9
RCHRES   22 GQUAL  SQAL    3 1         1.0      PLTGEN  13      INPUT  MEAN   10
*** Water quality output for pond B-2 ***
RCHRES   22 SEDTRN SSED    1 1         1.0      PLTGEN  14      INPUT  MEAN    1
RCHRES   22 SEDTRN SSED    2 1         1.0      PLTGEN  14      INPUT  MEAN    2
RCHRES   22 SEDTRN SSED    3 1         1.0      PLTGEN  14      INPUT  MEAN    3
RCHRES   22 GQUAL  SQAL    1 2         1.0      PLTGEN  14      INPUT  MEAN    4
RCHRES   22 GQUAL  SQAL    2 2         1.0      PLTGEN  14      INPUT  MEAN    5
RCHRES   22 GQUAL  SQAL    3 2         1.0      PLTGEN  14      INPUT  MEAN    6
RCHRES   22 GQUAL  SQAL    1 3         1.0      PLTGEN  14      INPUT  MEAN    7
RCHRES   22 GQUAL  SQAL    2 3         1.0      PLTGEN  14      INPUT  MEAN    8
RCHRES   22 GQUAL  SQAL    3 3         1.0      PLTGEN  14      INPUT  MEAN    9
RCHRES   22 HYDR   ROVOL               0.5      PLTGEN  14      INPUT  MEAN   10
*** Water quality output for pond B-3 ***
RCHRES   14 SEDTRN DEPSCR  4 1         1.0      PLTGEN  15      INPUT  MEAN    1
RCHRES   14 GQUAL  DSQAL   4 1         1.0      PLTGEN  15      INPUT  MEAN    2
RCHRES   14 GQUAL  DSQAL   4 2         1.0      PLTGEN  15      INPUT  MEAN    3
RCHRES   14 GQUAL  DSQAL   4 3         1.0      PLTGEN  15      INPUT  MEAN    4
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RCHRES  14 SEDTRN SSED   1 1       1.0     PLTGEN  15      INPUT  MEAN    5
RCHRES  14 SEDTRN SSED   2 1       1.0     PLTGEN  15      INPUT  MEAN    6
RCHRES  14 SEDTRN SSED   3 1       1.0     PLTGEN  15      INPUT  MEAN    7
RCHRES  14 GQUAL  SQAL   1 1       1.0     PLTGEN  15      INPUT  MEAN    8
RCHRES  14 GQUAL  SQAL   2 1       1.0     PLTGEN  15      INPUT  MEAN    9
RCHRES  14 GQUAL  SQAL   3 1       1.0     PLTGEN  15      INPUT  MEAN   10
*** Water quality output for pond B-3 ***
RCHRES  14 SEDTRN SSED   1 1       1.0     PLTGEN  16      INPUT  MEAN    1
RCHRES  14 SEDTRN SSED   2 1       1.0     PLTGEN  16      INPUT  MEAN    2
RCHRES  14 SEDTRN SSED   3 1       1.0     PLTGEN  16      INPUT  MEAN    3
RCHRES  14 GQUAL  SQAL   1 2       1.0     PLTGEN  16      INPUT  MEAN    4
RCHRES  14 GQUAL  SQAL   2 2       1.0     PLTGEN  16      INPUT  MEAN    5
RCHRES  14 GQUAL  SQAL   3 2       1.0     PLTGEN  16      INPUT  MEAN    6
RCHRES  14 GQUAL  SQAL   1 3       1.0     PLTGEN  16      INPUT  MEAN    7
RCHRES  14 GQUAL  SQAL   2 3       1.0     PLTGEN  16      INPUT  MEAN    8
RCHRES  14 GQUAL  SQAL   3 3       1.0     PLTGEN  16      INPUT  MEAN    9
RCHRES  14 HYDR   ROVOL  1 1       0.5     PLTGEN  16      INPUT  MEAN   10
*** Water quality output for pond B-4 ***
RCHRES  16 SEDTRN DEPSCR 4 1       1.0     PLTGEN  17      INPUT  MEAN    1
RCHRES  16 GQUAL  DSQAL  4 1       1.0     PLTGEN  17      INPUT  MEAN    2
RCHRES  16 GQUAL  DSQAL  4 2       1.0     PLTGEN  17      INPUT  MEAN    3
RCHRES  16 GQUAL  DSQAL  4 3       1.0     PLTGEN  17      INPUT  MEAN    4
RCHRES  16 SEDTRN SSED   1 1       1.0     PLTGEN  17      INPUT  MEAN    5
RCHRES  16 SEDTRN SSED   2 1       1.0     PLTGEN  17      INPUT  MEAN    6
RCHRES  16 SEDTRN SSED   3 1       1.0     PLTGEN  17      INPUT  MEAN    7
RCHRES  16 GQUAL  SQAL   1 1       1.0     PLTGEN  17      INPUT  MEAN    8
RCHRES  16 GQUAL  SQAL   2 1       1.0     PLTGEN  17      INPUT  MEAN    9
RCHRES  16 GQUAL  SQAL   3 1       1.0     PLTGEN  17      INPUT  MEAN   10
*** Water quality output for pond B-4 ***
RCHRES  16 SEDTRN SSED   1 1       1.0     PLTGEN  18      INPUT  MEAN    1
RCHRES  16 SEDTRN SSED   2 1       1.0     PLTGEN  18      INPUT  MEAN    2
RCHRES  16 SEDTRN SSED   3 1       1.0     PLTGEN  18      INPUT  MEAN    3
RCHRES  16 GQUAL  SQAL   1 2       1.0     PLTGEN  18      INPUT  MEAN    4
RCHRES  16 GQUAL  SQAL   2 2       1.0     PLTGEN  18      INPUT  MEAN    5
RCHRES  16 GQUAL  SQAL   3 2       1.0     PLTGEN  18      INPUT  MEAN    6
RCHRES  16 GQUAL  SQAL   1 3       1.0     PLTGEN  18      INPUT  MEAN    7
RCHRES  16 GQUAL  SQAL   2 3       1.0     PLTGEN  18      INPUT  MEAN    8
RCHRES  16 GQUAL  SQAL   3 3       1.0     PLTGEN  18      INPUT  MEAN    9
RCHRES  16 HYDR   ROVOL  1 1       0.5     PLTGEN  18      INPUT  MEAN   10
*** Water quality output for pond B-5 ***
RCHRES  18 SEDTRN DEPSCR 4 1       1.0     PLTGEN  19      INPUT  MEAN    1
RCHRES  18 GQUAL  DSQAL  4 1       1.0     PLTGEN  19      INPUT  MEAN    2
RCHRES  18 GQUAL  DSQAL  4 2       1.0     PLTGEN  19      INPUT  MEAN    3
RCHRES  18 GQUAL  DSQAL  4 3       1.0     PLTGEN  19      INPUT  MEAN    4
RCHRES  18 SEDTRN SSED   1 1       1.0     PLTGEN  19      INPUT  MEAN    5
RCHRES  18 SEDTRN SSED   2 1       1.0     PLTGEN  19      INPUT  MEAN    6
RCHRES  18 SEDTRN SSED   3 1       1.0     PLTGEN  19      INPUT  MEAN    7
RCHRES  18 GQUAL  SQAL   1 1       1.0     PLTGEN  19      INPUT  MEAN    8
RCHRES  18 GQUAL  SQAL   2 1       1.0     PLTGEN  19      INPUT  MEAN    9
RCHRES  18 GQUAL  SQAL   3 1       1.0     PLTGEN  19      INPUT  MEAN   10
*** Water quality output for pond B-5 ***
RCHRES  18 SEDTRN SSED   1 1       1.0     PLTGEN  20      INPUT  MEAN    1
RCHRES  18 SEDTRN SSED   2 1       1.0     PLTGEN  20      INPUT  MEAN    2
RCHRES  18 SEDTRN SSED   3 1       1.0     PLTGEN  20      INPUT  MEAN    3
RCHRES  18 GQUAL  SQAL   1 2       1.0     PLTGEN  20      INPUT  MEAN    4
RCHRES  18 GQUAL  SQAL   2 2       1.0     PLTGEN  20      INPUT  MEAN    5
RCHRES  18 GQUAL  SQAL   3 2       1.0     PLTGEN  20      INPUT  MEAN    6
RCHRES  18 GQUAL  SQAL   1 3       1.0     PLTGEN  20      INPUT  MEAN    7
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RCHRES  18 GQUAL  SQAL    2 3         1.0      PLTGEN  20      INPUT  MEAN    8
RCHRES  18 GQUAL  SQAL    3 3         1.0      PLTGEN  20      INPUT  MEAN    9
RCHRES  18 HYDR   ROVOL   1 1         0.5      PLTGEN  20      INPUT  MEAN   10
*** MISC. OUTPUT ***
RCHRES  25 HYDR   VOL     1 1         1.0      PLTGEN  21      INPUT  MEAN    1
RCHRES  26 HYDR   VOL     1 1         1.0      PLTGEN  21      INPUT  MEAN    2
RCHRES  10 HYDR   VOL     1 1         1.0      PLTGEN  21      INPUT  MEAN    3
RCHRES  12 HYDR   VOL     1 1         1.0      PLTGEN  21      INPUT  MEAN    4
RCHRES  21 HYDR   VOL     1 1         1.0      PLTGEN  21      INPUT  MEAN    5
RCHRES  22 HYDR   VOL     1 1         1.0      PLTGEN  21      INPUT  MEAN    6
RCHRES  14 HYDR   VOL     1 1         1.0      PLTGEN  21      INPUT  MEAN    7
RCHRES  16 HYDR   VOL     1 1         1.0      PLTGEN  21      INPUT  MEAN    8
RCHRES  18 HYDR   VOL     1 1         1.0      PLTGEN  21      INPUT  MEAN    9
RCHRES  07 HYDR   VOL     1 1         1.0      PLTGEN  21      INPUT  MEAN   10

RCHRES  10 SEDTRN ROSED   4 1   ***   1.0      PLTGEN  21      INPUT  MEAN    1
RCHRES  05 SEDTRN ROSED   4 1   ***   1.0      PLTGEN  21      INPUT  MEAN    2
RCHRES   8 SEDTRN DEPSCR  4     ***   1.0      PLTGEN  21      INPUT  MEAN    3
RCHRES  11 SEDTRN DEPSCR  4     ***   1.0      PLTGEN  21      INPUT  MEAN    4
RCHRES  27 SEDTRN DEPSCR  4     ***   1.0      PLTGEN  21      INPUT  MEAN    5
RCHRES  15 SEDTRN DEPSCR  4     ***   1.0      PLTGEN  21      INPUT  MEAN    6
RCHRES  17 SEDTRN DEPSCR  4     ***   1.0      PLTGEN  21      INPUT  MEAN    7
RCHRES  23 SEDTRN DEPSCR  4     ***   1.0      PLTGEN  21      INPUT  MEAN    8
RCHRES  20 SEDTRN DEPSCR  4     ***   1.0      PLTGEN  21      INPUT  MEAN    9
RCHRES  19 SEDTRN DEPSCR  4     ***   1.0      PLTGEN  21      INPUT  MEAN   10

****     244 IS CONVERS. FROM IN/HR TO CFS FOR 242 ACRES
***       other numbers are number of acres assuming 1:1

****     0.5 & SUM in curve data convrts. ac-ft/hr to mean cfs   ****

END NETWORK

END RUN
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DRAFT

MEASURED TSS ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L	Validation
SW019	12-Apr-91	TSS	110	MG/L			5	
SW019	23-Jul-91	TSS	15	MG/L			5	V
SW020	12-Apr-91	TSS	244	MG/L			5	
SW020	23-Jul-91	TSS	70	MG/L			5	V
SW023	23-Jul-90	TSS	1600	MG/L		20		
SW023	24-Jul-90	TSS	120	MG/L		10		
SW023	19-Sep-90	TSS	360	MG/L		2		
SW023	16-Oct-90	TSS	5	MG/L		4		
SW023	8-Nov-90	TSS	115	MG/L				
SW023	16-Nov-90	TSS	4	MG/L	U	4		
SW023	19-Nov-90	TSS	62	MG/L		4		
SW023	4-Dec-90	TSS	5	MG/L		4	R	
SW023	4-Dec-90	TSS	4	MG/L	U	4	R	
SW023	10-Dec-90	TSS	190	MG/L		2		
SW023	19-Dec-90	TSS	39	MG/L		4		
SW023	14-Jan-91	TSS	4	MG/L	U	4		
SW023	22-Feb-91	TSS	36	MG/L		4		
SW023	28-Mar-91	TSS	53	MG/L		5	JA	
SW023	15-Apr-91	TSS	420	MG/L		2		
SW023	17-Apr-91	TSS	8	MG/L		5		
SW023	17-Apr-91	TSS	5	MG/L	U	5		
SW023	23-Apr-91	TSS	420	MG/L		2		
SW023	1-May-91	TSS	160	MG/L		2		After rain
SW023	17-May-91	TSS	590	MG/L		2		
SW023	20-May-91	TSS	8	MG/L	V	85		
SW023	28-May-91	TSS	290	MG/L		2		
SW023	29-May-91	TSS	67	MG/L		2		
SW023	25-Jun-91	TSS	5	MG/L	U	5	V	
SW023	17-Jul-91	TSS	4	MG/L	U	4		
SW023	23-Jul-91	TSS	3	MG/L		2		
SW023	6-Aug-91	TSS	5	MG/L	U	5	V	
SW023	6-Aug-91	TSS	5	MG/L	U	5		
SW023	7-Aug-91	TSS	1050	MG/L		2		After rain
SW023	12-Aug-91	TSS	72	MG/L		2		
SW023	16-Sep-91	TSS	5	MG/L		5	V	
SW023	16-Sep-91	TSS	5	MG/L		5		
SW023	16-Sep-91	TSS	5	MG/L	U	5	V	
SW023	16-Sep-91	TSS	5	MG/L	U	5		
SW023	15-Oct-91	TSS	5	MG/L		5	V	
SW023	15-Oct-91	TSS	5	MG/L		5		
SW023	20-Jan-92	TSS	5	MG/L	U	5	V	
SW023	23-Apr-92	TSS	5	MG/L	U	5	V	
	Max		1600					
	Min		3					
	Mean		15.11					
	Median		10					

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L	Validation
SW061	22-Jul-87	TSS	8	MG/L			1	
SW061	1-Jul-88	TSS	5	MG/L				
SW061	20-Mar-89	TSS	54	MG/L				A
SW061	15-May-89	TSS	18	MG/L				A
SW061	9-Jun-89	TSS	15	MG/L				A
SW061	6-Jul-89	TSS	11	MG/L				A
SW061	3-Aug-89	TSS	5	MG/L		UJ		A
SW061	11-Sep-89	TSS	5	MG/L		UJ		A
SW061	3-Oct-89	TSS	5	MG/L		U		A
SW061	6-Nov-89	TSS	14	MG/L				A
SW061	6-Dec-89	TSS	24	MG/L				
SW061	6-Dec-89	TSS	24	MG/L				
SW061	23-Jan-90	TSS	5	MG/L		U		
SW061	9-Feb-90	TSS	78	MG/L				V
SW061	12-Mar-90	TSS	10	MG/L				V
SW061	23-May-90	TSS	5	MG/L		U		
SW061	23-Jul-90	TSS	10	MG/L			4	
SW061	22-Aug-90	TSS	8	MG/L			4	
SW061	17-Oct-90	TSS	4	MG/L		U	4	
SW061	26-Nov-90	TSS	5	MG/L			4	
SW061	7-Dec-90	TSS	43	MG/L			4	V
SW061	27-Mar-91	TSS	16	MG/L			5	JA 12
SW061	11-Apr-91	TSS	830	MG/L			5	
SW061	8-May-91	TSS	5	MG/L		U	5	
SW061	20-Jun-91	TSS	11	MG/L			5	
SW061	12-Jul-91	TSS	5	MG/L		U	5	V
SW061	7-Aug-91	TSS	5	MG/L		U	5	V
SW061	17-Sep-91	TSS	5	MG/L		U	5	V
SW061	17-Oct-91	TSS	5	MG/L		U	5	V
SW061	27-Jan-92	TSS	22	MG/L			5	V
SW061	6-Apr-92	TSS	5	MG/L		U	5	V
SW061	22-Apr-92	TSS	5	MG/L		U	5	V
SW061	27-Apr-92	TSS	5	MG/L		U	5	V
SW061	6-May-92	TSS	5	MG/L		U	5	V
SW061	20-May-92	TSS	5	MG/L		U	5	V
SW061	4-Jun-92	TSS	4	MG/L		U	4	V
SW061	17-Jun-92	TSS	7	MG/L			5	V
SW061	2-Jul-92	TSS	5	MG/L		U	5	V
SW061	15-Jul-92	TSS	5	MG/L			5	V
SW061	29-Jul-92	TSS	5	MG/L		U	5	V
SW061	12-Aug-92	TSS	5	MG/L		U	5	V
SW061	20-Aug-92	TSS	5	MG/L		U	5	V
SW061	26-Aug-92	TSS	5	MG/L		U	5	V
SW061	8-Sep-92	TSS	5	MG/L		U	5	V
SW061	22-Sep-92	TSS	5	MG/L		U	5	V
SW061	7-Oct-92	TSS	23	MG/L			5	V
SW061	21-Oct-92	TSS	24.5	MG/L			5	V
SW061	6-Nov-92	TSS	29	MG/L			5	JA 1
SW061	17-Nov-92	TSS	5	MG/L		U	5	V

MEASURED TSS ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L	Validation
SW061	3-Dec-92	TSS	10	MG/L			5	V
SW061	6-Jan-93	TSS	5	MG/L			5	V
SW061	13-Jan-93	TSS	9	MG/L			4	V
SW061	27-Jan-93	TSS	34	MG/L			5	V
SW061	9-Feb-93	TSS	5	MG/L			4	V
SW061	24-Feb-93	TSS	12	MG/L			4	V
SW061	12-Mar-93	TSS	120	MG/L			5	V
SW061	23-Mar-93	TSS	4	MG/L		U	4	V
SW061	7-Apr-93	TSS	17	MG/L			5	V
SW061	22-Apr-93	TSS	4	MG/L		U	4	V
SW061	5-May-93	TSS	9	MG/L			5	V
SW061	19-May-93	TSS	5	MG/L		U	5	V
SW061	2-Jun-93	TSS	5	MG/L			5	V
SW061	16-Jun-93	TSS	5	MG/L		U	5	V
SW061	30-Jun-93	TSS	8	MG/L			5	V
SW061	14-Jul-93	TSS	5	MG/L		U	5	V
SW061	28-Jul-93	TSS	5	MG/L		U	5	V
SW061	11-Aug-93	TSS	5	MG/L		U	5	V
SW061	27-Aug-93	TSS	4	MG/L		U	4	V
SW061	8-Sep-93	TSS	12	MG/L			4	V
SW061	21-Sep-93	TSS	4	MG/L		U	4	V
SW061	28-Sep-93	TSS	4	MG/L		U	4	V
SW061	5-Oct-93	TSS	4	MG/L		U	4	V
SW061	13-Oct-93	TSS	11	MG/L			4	V
SW061	19-Oct-93	TSS	4	MG/L		U	4	V
SW061	28-Oct-93	TSS	7	MG/L			4	V
SW061	4-Nov-93	TSS	4	MG/L		U	4	V
SW061	9-Nov-93	TSS	4	MG/L		U	4	V
SW061	18-Nov-93	TSS	4	MG/L		U	4	V
SW061	26-Nov-93	TSS	4	MG/L		U	4	V
SW061	30-Nov-93	TSS	4	MG/L		U	4	V
SW061	9-Dec-93	TSS	4	MG/L		U	4	V
SW061	16-Dec-93	TSS	4	MG/L		U	4	V
SW061	23-Dec-93	TSS	6	MG/L			4	V
SW061	27-Dec-93	TSS	5	MG/L			4	V
SW061	6-Jan-94	TSS	4	MG/L		U	4	V
SW061	13-Jan-94	TSS	10	MG/L			4	V
SW061	20-Jan-94	TSS	7	MG/L			4	V
SW061	27-Jan-94	TSS	8	MG/L		U	4	V
SW061	4-Feb-94	TSS	6	MG/L			4	V
SW061	10-Feb-94	TSS	29	MG/L			4	V
SW061	15-Feb-94	TSS	4	MG/L		U	4	V
SW061	24-Feb-94	TSS	10	MG/L			4	V
SW061	3-Mar-94	TSS	4	MG/L		U	4	V
SW061	10-Mar-94	TSS	4	MG/L		U	4	V
SW061	17-Mar-94	TSS	6	MG/L			4	V
SW061	22-Mar-94	TSS	4	MG/L		U	4	V
SW061	31-Mar-94	TSS	4	MG/L		U	4	Y
SW061	7-Apr-94	TSS	16	MG/L			4	Y

MEASURED TSS ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L	Validation
SW061	14-Apr-94	TSS	4	MG/L		U	4	Y
SW061	19-Apr-94	TSS	4	MG/L		U	4	Y
SW061	5-May-94	TSS	4	MG/L		U	4	Y
SW061	12-May-94	TSS	5	MG/L			4	Y
SW061	19-May-94	TSS	28	MG/L			4	Y
SW061	24-May-94	TSS	4	MG/L		U	4	Y
SW061	2-Jun-94	TSS	4	MG/L		U	4	Y
SW061	9-Jun-94	TSS	4	MG/L		U	4	Y
SW061	16-Jun-94	TSS	10	MG/L			4	Y
SW061	23-Jun-94	TSS	17	MG/L			4	Y
SW061	30-Jun-94	TSS	4	MG/L		U	4	Y
SW122	11-Oct-90	TSS	4	MG/L		U	4	
SW122	17-Dec-90	TSS	110	MG/L			4	R 4
SW122	25-Mar-91	TSS	11	MG/L			5	V
SW122	23-Apr-91	TSS	5	MG/L		U	5	
SW122	29-May-91	TSS	5	MG/L		U	5	V
SW122	19-Jun-91	TSS	5	MG/L		U	5	
SW122	15-Jul-91	TSS	5	MG/L		U	5	V
SW122	19-Aug-91	TSS	5	MG/L		U	5	V
SW122	10-Sep-91	TSS	8	MG/L			5	V
SW122	7-Oct-91	TSS	6	MG/L			5	V
SW122	10-Feb-92	TSS	5	MG/L		U	5	V
SWB1	7-Jul-89	TSS	5	MG/L		U		
SWB1	10-Jul-89	TSS	5	MG/L		U		
SWB1	21-Aug-89	TSS	5	MG/L		U		
SWB1	22-Aug-89	TSS	5	MG/L		U		
SWB2	3-Jul-89	TSS	5	MG/L		U		
SWB2	5-Jul-89	TSS	5	MG/L		U		
SWB2	17-Aug-89	TSS	7	MG/L				
SWB2	17-Aug-89	TSS	16	MG/L				
SWB2	17-Aug-89	TSS	5	MG/L		U		
SWB2	17-Aug-89	TSS	24	MG/L				
SWB2	17-Aug-89	TSS	34	MG/L				
SWB3	6-Jul-89	TSS	8	MG/L				
SWB3	6-Jul-89	TSS	9	MG/L				
SWB3	6-Jul-89	TSS	9	MG/L				
SWB3	7-Jul-89	TSS	10	MG/L				
SWB3	16-Aug-89	TSS	14	MG/L				
SWB3	16-Aug-89	TSS	14	MG/L				
SWB3	16-Aug-89	TSS	18	MG/L				
SWB4	29-Jun-89	TSS	5	MG/L		U		
SWB4	30-Jun-89	TSS	5	MG/L		U		
SWB4	30-Jun-89	TSS	6	MG/L				
SWB4	15-Aug-89	TSS	24	MG/L				

MEASURED TSS ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L	Validation
SWB4	15-Aug-89	TSS	14	MG/L				
SWB4	15-Aug-89	TSS	18	MG/L				
			12					
SWB5	22-Jun-89	TSS	10	MG/L				
SWB5	23-Jun-89	TSS	10	MG/L				
SWB5	26-Jun-89	TSS	18	MG/L				
SWB5	26-Jun-89	TSS	12	MG/L				
SWB5	26-Jun-89	TSS	12	MG/L				
SWB5	26-Jun-89	TSS	12	MG/L				
SWB5	27-Jun-89	TSS	5	MG/L				
SWB5	27-Jun-89	TSS	5	MG/L		U		
SWB5	27-Jun-89	TSS	14	MG/L				
SWB5	28-Jun-89	TSS	5	MG/L				
SWB5	28-Jun-89	TSS	7	MG/L				
SWB5	28-Jun-89	TSS	5	MG/L		U		
SWB5	28-Jun-89	TSS	5	MG/L		U		
SWB5	31-Jul-89	TSS	16	MG/L				A
SWB5	31-Jul-89	TSS	12	MG/L				A
SWB5	1-Aug-89	TSS	5	MG/L		U		A
SWB5	10-Aug-89	TSS	10	MG/L				
SWB5	10-Aug-89	TSS	14	MG/L				
SWB5	10-Aug-89	TSS	5	MG/L		U		
SWB5	10-Aug-89	TSS	5	MG/L		U		
SWB5	11-Aug-89	TSS	5	MG/L		U		
SWB5	11-Aug-89	TSS	5	MG/L		U		
SWB5	14-Aug-89	TSS	12	MG/L				
SWB5	14-Aug-89	TSS	17	MG/L				
SWB5	14-Aug-89	TSS	44	MG/L				
SWB5	29-Mar-90	TSS	5.5	MG/L			5	
SWB5	29-Mar-90	TSS	5.5	MG/L			5	
SWB5	29-Mar-90	TSS	5	MG/L		U	5	
SWB5	29-Mar-90	TSS	5	MG/L		U	5	
SWB5	30-Mar-90	TSS	6.5	MG/L			5	
SWB5	30-Mar-90	TSS	6.5	MG/L			5	
SWB5	30-Mar-90	TSS	40	MG/L			10	
SWB5	30-Mar-90	TSS	5	MG/L		U	5	
SWB5	30-Mar-90	TSS	5	MG/L		U	5	
SWB5	30-Mar-90	TSS	20	MG/L			10	
SWB5	31-Mar-90	TSS	5	MG/L		U	5	
SWB5	31-Mar-90	TSS	5	MG/L		U	5	
SWB5	31-Mar-90	TSS	5	MG/L		U	5	
SWB5	31-Mar-90	TSS	5	MG/L		U	5	
SWB5	1-Apr-90	TSS	10	MG/L			5	V
SWB5	1-Apr-90	TSS	7	MG/L			5	V
SWB5	2-Apr-90	TSS	12	MG/L			5	V
SWB5	2-Apr-90	TSS	9	MG/L			5	V
SWB5	3-Apr-90	TSS	8.5	MG/L			5	
SWB5	3-Apr-90	TSS	8.5	MG/L			5	
WB5	3-Apr-90	TSS	5	MG/L		U	5	

MEASURED TSS ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L	Validation
SWB5	3-Apr-90	TSS	5	MG/L		U	5	
SWB5	4-Apr-90	TSS	15	MG/L			5	
SWB5	4-Apr-90	TSS	15	MG/L			5	
SWB5	4-Apr-90	TSS	14	MG/L			5	
SWB5	4-Apr-90	TSS	14	MG/L			5	
SWB5	5-Apr-90	TSS	12	MG/L			5	
SWB5	5-Apr-90	TSS	12	MG/L			5	
SWB5	5-Apr-90	TSS	5.5	MG/L			5	
SWB5	5-Apr-90	TSS	5.5	MG/L			5	
SWB5	6-Apr-90	TSS	20	MG/L			5	
SWB5	6-Apr-90	TSS	20	MG/L			5	
SWB5	6-Apr-90	TSS	20	MG/L			5	
SWB5	6-Apr-90	TSS	20	MG/L			5	
SWB5	7-Apr-90	TSS	23	MG/L			5	
SWB5	7-Apr-90	TSS	23	MG/L			5	
SWB5	7-Apr-90	TSS	19	MG/L			5	
SWB5	7-Apr-90	TSS	19	MG/L			5	
SWB5	7-Apr-90	TSS	18	MG/L			5	
SWB5	7-Apr-90	TSS	18	MG/L			5	
SWB5	8-Apr-90	TSS	14.5	MG/L			5	
SWB5	8-Apr-90	TSS	14.5	MG/L			5	
SWB5	8-Apr-90	TSS	5	MG/L		U	5	
SWB5	8-Apr-90	TSS	5	MG/L		U	5	
SWB5	8-Apr-90	TSS	7	MG/L			5	
SWB5	8-Apr-90	TSS	7	MG/L			5	
SWB5	9-Apr-90	TSS	20	MG/L			5	
SWB5	9-Apr-90	TSS	20	MG/L			5	
SWB5	9-Apr-90	TSS	7	MG/L			5	
SWB5	9-Apr-90	TSS	7	MG/L			5	
SWB5	9-Apr-90	TSS	22	MG/L			5	
SWB5	9-Apr-90	TSS	22	MG/L			5	
SWB5	10-Apr-90	TSS	15	MG/L			5	
SWB5	10-Apr-90	TSS	15	MG/L			5	
SWB5	10-Apr-90	TSS	5	MG/L			5	
SWB5	10-Apr-90	TSS	5	MG/L			5	
SWB5	10-Apr-90	TSS	21	MG/L			5	
SWB5	10-Apr-90	TSS	21	MG/L			5	
SWB5	11-Apr-90	TSS	11	MG/L			5	
SWB5	11-Apr-90	TSS	11	MG/L			5	
SWB5	11-Apr-90	TSS	5	MG/L		U	5	
SWB5	11-Apr-90	TSS	5	MG/L		U	5	
SWB5	11-Apr-90	TSS	7.5	MG/L			5	
SWB5	11-Apr-90	TSS	7.5	MG/L			5	
SWB5	12-Apr-90	TSS	43	MG/L			5	
SWB5	12-Apr-90	TSS	43	MG/L			5	
SWB5	12-Apr-90	TSS	43	MG/L			5	
SWB5	12-Apr-90	TSS	8	MG/L			5	
SWB5	12-Apr-90	TSS	8	MG/L			5	
SWB5	12-Apr-90	TSS	8	MG/L			5	

MEASURED TSS ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L	Validation
SWB5	12-Apr-90	TSS	15	MG/L			5	
SWB5	12-Apr-90	TSS	15	MG/L			5	
SWB5	12-Apr-90	TSS	15	MG/L			5	
SWB5	13-Apr-90	TSS	8	MG/L			5	
SWB5	13-Apr-90	TSS	8	MG/L			5	
SWB5	13-Apr-90	TSS	6	MG/L			5	
SWB5	13-Apr-90	TSS	6	MG/L			5	
SWB5	13-Apr-90	TSS	14	MG/L			5	
SWB5	13-Apr-90	TSS	14	MG/L			5	
SWB5	14-Apr-90	TSS	55	MG/L			5	
SWB5	14-Apr-90	TSS	5	MG/L		U	5	
SWB5	14-Apr-90	TSS	10	MG/L			5	
SWB5	16-Apr-90	TSS	11	MG/L			5	
SWB5	16-Apr-90	TSS	11	MG/L			5	
SWB5	16-Apr-90	TSS	5.5	MG/L			5	
SWB5	16-Apr-90	TSS	5.5	MG/L			5	
SWB5	16-Apr-90	TSS	11	MG/L			5	
SWB5	16-Apr-90	TSS	11	MG/L			5	
SWB5	17-Apr-90	TSS	14.5	MG/L			5	
SWB5	17-Apr-90	TSS	14.5	MG/L			5	
SWB5	17-Apr-90	TSS	6.5	MG/L			5	
SWB5	17-Apr-90	TSS	6.5	MG/L			5	
SWB5	17-Apr-90	TSS	16.5	MG/L			5	
SWB5	17-Apr-90	TSS	16.5	MG/L			5	
SWB5	18-Apr-90	TSS	16	MG/L			5	
SWB5	18-Apr-90	TSS	16	MG/L			5	
SWB5	18-Apr-90	TSS	5	MG/L			5	
SWB5	18-Apr-90	TSS	5	MG/L			5	
SWB5	18-Apr-90	TSS	11	MG/L			5	
SWB5	18-Apr-90	TSS	11	MG/L			5	
SWB5	19-Apr-90	TSS	10	MG/L			5	
SWB5	19-Apr-90	TSS	10	MG/L			5	
SWB5	19-Apr-90	TSS	5	MG/L		U	5	
SWB5	19-Apr-90	TSS	5	MG/L		U	5	
SWB5	19-Apr-90	TSS	11.5	MG/L			5	
SWB5	19-Apr-90	TSS	11.5	MG/L			5	
SWB5	20-Apr-90	TSS	12.5	MG/L			5	
SWB5	20-Apr-90	TSS	12.5	MG/L			5	
SWB5	20-Apr-90	TSS	5	MG/L		U	5	
SWB5	20-Apr-90	TSS	5	MG/L		U	5	
SWB5	20-Apr-90	TSS	21	MG/L			5	
SWB5	20-Apr-90	TSS	21	MG/L			5	
SWB5	21-Apr-90	TSS	14.5	MG/L			5	
SWB5	21-Apr-90	TSS	14.5	MG/L			5	
SWB5	21-Apr-90	TSS	5	MG/L		U	5	
SWB5	21-Apr-90	TSS	5	MG/L		U	5	
SWB5	21-Apr-90	TSS	6	MG/L			5	
SWB5	21-Apr-90	TSS	6	MG/L			5	
SWB5	22-Apr-90	TSS	34	MG/L			5	

MEASURED TSS ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L	Validation
SWB5	22-Apr-90	TSS	34	MG/L			5	
SWB5	22-Apr-90	TSS	5	MG/L		U	5	
SWB5	22-Apr-90	TSS	5	MG/L		U	5	
SWB5	22-Apr-90	TSS	5	MG/L		U	5	
SWB5	22-Apr-90	TSS	5	MG/L		U	5	
SWB5	23-Apr-90	TSS	42.5	MG/L			5	
SWB5	23-Apr-90	TSS	42.5	MG/L			5	
SWB5	23-Apr-90	TSS	5	MG/L		U	5	
SWB5	23-Apr-90	TSS	5	MG/L		U	5	
SWB5	23-Apr-90	TSS	5	MG/L		U	5	
SWB5	23-Apr-90	TSS	5	MG/L		U	5	
SWB5	24-Apr-90	TSS	19.5	MG/L			5	
SWB5	24-Apr-90	TSS	19.5	MG/L			5	
SWB5	24-Apr-90	TSS	5	MG/L		U	5	
SWB5	24-Apr-90	TSS	5	MG/L		U	5	
SWB5	24-Apr-90	TSS	27	MG/L			5	
SWB5	24-Apr-90	TSS	27	MG/L			5	
SWB5	25-Apr-90	TSS	39	MG/L			5	
SWB5	25-Apr-90	TSS	39	MG/L			5	
SWB5	25-Apr-90	TSS	25	MG/L			5	
SWB5	25-Apr-90	TSS	25	MG/L			5	
SWB5	25-Apr-90	TSS	34.5	MG/L			5	
SWB5	25-Apr-90	TSS	34.5	MG/L			5	
SWB5	26-Apr-90	TSS	22.5	MG/L			5	
SWB5	26-Apr-90	TSS	22.5	MG/L			5	
SWB5	26-Apr-90	TSS	10	MG/L			5	
SWB5	26-Apr-90	TSS	10	MG/L			5	
SWB5	26-Apr-90	TSS	19	MG/L			5	
SWB5	26-Apr-90	TSS	19	MG/L			5	
SWB5	27-Apr-90	TSS	62	MG/L			5	
SWB5	27-Apr-90	TSS	62	MG/L			5	
SWB5	28-Apr-90	TSS	92.5	MG/L			5	
SWB5	28-Apr-90	TSS	48	MG/L			5	
SWB5	28-Apr-90	TSS	48	MG/L			5	
SWB5	28-Apr-90	TSS	10	MG/L			5	
SWB5	28-Apr-90	TSS	10	MG/L			5	
SWB5	28-Apr-90	TSS	41.5	MG/L			5	
SWB5	28-Apr-90	TSS	41.5	MG/L			5	
SWB5	29-Apr-90	TSS	34.5	MG/L			5	
SWB5	29-Apr-90	TSS	13	MG/L			5	
SWB5	29-Apr-90	TSS	35	MG/L			5	
SWB5	30-Apr-90	TSS	30	MG/L			5	
SWB5	30-Apr-90	TSS	7	MG/L			5	
SWB5	30-Apr-90	TSS	67	MG/L			5	
SWB5	1-May-90	TSS	23.5	MG/L			5	
SWB5	1-May-90	TSS	23.5	MG/L			5	
SWB5	2-May-90	TSS	26.5	MG/L			5	
SWB5	2-May-90	TSS	26.5	MG/L			5	
SWB5	2-May-90	TSS	6.5	MG/L			5	

MEASURED TSS ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L	Validation
SWB5	2-May-90	TSS	6.5	MG/L			5	
SWB5	2-May-90	TSS	12	MG/L			5	
SWB5	2-May-90	TSS	12	MG/L			5	
SWB5	3-May-90	TSS	23	MG/L			5	
SWB5	3-May-90	TSS	23	MG/L			5	
SWB5	3-May-90	TSS	5	MG/L		U	5	
SWB5	3-May-90	TSS	5	MG/L		U	5	
SWB5	3-May-90	TSS	11	MG/L			5	
SWB5	3-May-90	TSS	11	MG/L			5	
SWB5	4-May-90	TSS	25	MG/L			5	
SWB5	4-May-90	TSS	25	MG/L			5	
SWB5	4-May-90	TSS	5	MG/L		U	5	
SWB5	4-May-90	TSS	5	MG/L		U	5	
SWB5	4-May-90	TSS	19.5	MG/L			5	
SWB5	4-May-90	TSS	19.5	MG/L			5	
SWB5	5-May-90	TSS	18.5	MG/L			5	
SWB5	5-May-90	TSS	18.5	MG/L			5	
SWB5	5-May-90	TSS	45	MG/L			5	
SWB5	5-May-90	TSS	45	MG/L			5	
SWB5	5-May-90	TSS	8.5	MG/L			5	
SWB5	5-May-90	TSS	8.5	MG/L			5	
SWB5	5-May-90	TSS	33.5	MG/L			5	
SWB5	5-May-90	TSS	33.5	MG/L			5	
SWB5	6-May-90	TSS	5	MG/L		U	5	
SWB5	6-May-90	TSS	5	MG/L		U	5	
SWB5	6-May-90	TSS	14	MG/L			5	
SWB5	6-May-90	TSS	14	MG/L			5	
SWB5	7-May-90	TSS	26	MG/L			5	
SWB5	7-May-90	TSS	26	MG/L			5	
SWB5	7-May-90	TSS	15	MG/L			5	
SWB5	7-May-90	TSS	15	MG/L			5	
SWB5	8-May-90	TSS	16	MG/L			5	
SWB5	8-May-90	TSS	16	MG/L			5	
SWB5	8-May-90	TSS	9	MG/L			5	
SWB5	8-May-90	TSS	9	MG/L			5	
SWB5	9-May-90	TSS	16	MG/L			5	
SWB5	9-May-90	TSS	16	MG/L			5	
SWB5	9-May-90	TSS	5	MG/L		U	5	
SWB5	9-May-90	TSS	5	MG/L		U	5	
SWB5	9-May-90	TSS	12	MG/L			5	
SWB5	9-May-90	TSS	12	MG/L			5	
SWB5	10-May-90	TSS	33.5	MG/L			10	
SWB5	10-May-90	TSS	33.5	MG/L			10	
SWB5	10-May-90	TSS	13.5	MG/L			10	
SWB5	10-May-90	TSS	13.5	MG/L			10	
SWB5	11-May-90	TSS	10	MG/L			5	
SWB5	11-May-90	TSS	10	MG/L			5	
SWB5	11-May-90	TSS	5	MG/L		U	5	
SWB5	11-May-90	TSS	5	MG/L		U	5	

MEASURED TSS ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L	Validation
SWB5	11-May-90	TSS	8	MG/L			5	
SWB5	11-May-90	TSS	8	MG/L			5	
SWB5	12-May-90	TSS	19	MG/L			5	
SWB5	12-May-90	TSS	8	MG/L			5	
SWB5	12-May-90	TSS	13	MG/L			5	
SWB5	13-May-90	TSS	8	MG/L			5	
SWB5	13-May-90	TSS	8	MG/L			5	
SWB5	13-May-90	TSS	5	MG/L			5	
SWB5	13-May-90	TSS	5	MG/L			5	
SWB5	13-May-90	TSS	7	MG/L			5	
SWB5	13-May-90	TSS	7	MG/L			5	
SWB5	14-May-90	TSS	25	MG/L			5	
SWB5	14-May-90	TSS	25	MG/L			5	
SWB5	15-May-90	TSS	16	MG/L			5	
SWB5	15-May-90	TSS	16	MG/L			5	
SWB5	15-May-90	TSS	6.5	MG/L			5	
SWB5	15-May-90	TSS	6.5	MG/L			5	
SWB5	15-May-90	TSS	19	MG/L			5	
SWB5	15-May-90	TSS	19	MG/L			5	
SWB5	16-May-90	TSS	93	MG/L			5	
SWB5	16-May-90	TSS	93	MG/L			5	
SWB5	16-May-90	TSS	11	MG/L			5	
SWB5	16-May-90	TSS	11	MG/L			5	
SWB5	16-May-90	TSS	26	MG/L			5	
SWB5	16-May-90	TSS	26	MG/L			5	
SWB5	17-May-90	TSS	24.5	MG/L			5	
SWB5	17-May-90	TSS	24.5	MG/L			5	
SWB5	17-May-90	TSS	14	MG/L			5	
SWB5	17-May-90	TSS	14	MG/L			5	
SWB5	17-May-90	TSS	27	MG/L			5	
SWB5	17-May-90	TSS	27	MG/L			5	
SWB5	18-May-90	TSS	30	MG/L			5	
SWB5	18-May-90	TSS	5	MG/L			5	
SWB5	19-May-90	TSS	5	MG/L		U	5	
SWB5	19-May-90	TSS	5	MG/L		U	5	
SWB5	19-May-90	TSS	5	MG/L		U	5	
SWB5	19-May-90	TSS	5	MG/L		U	5	
SWB5	19-May-90	TSS	42	MG/L			5	
SWB5	19-May-90	TSS	42	MG/L			5	
SWB5	20-May-90	TSS	12	MG/L			5	
SWB5	20-May-90	TSS	10	MG/L			5	
SWB5	20-May-90	TSS	5	MG/L		U	5	
SWB5	21-May-90	TSS	71	MG/L			5	
SWB5	21-May-90	TSS	7	MG/L			5	
SWB5	21-May-90	TSS	6	MG/L			5	
SWB5	22-May-90	TSS	27	MG/L			10	
SWB5	23-May-90	TSS	55	MG/L			5	
SWB5	24-May-90	TSS	19.5	MG/L			5	
SWB5	26-May-90	TSS	5	MG/L		U	5	

MEASURED TSS ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L	Validation
SWB5	26-May-90	TSS	5	MG/L		U	5	
SWB5	26-May-90	TSS	5	MG/L		U	5	
SWB5	27-May-90	TSS	32	MG/L			5	
SWB5	27-May-90	TSS	32	MG/L			5	
SWB5	28-May-90	TSS	10	MG/L			5	
SWB5	28-May-90	TSS	10	MG/L			5	
SWB5	29-May-90	TSS	15	MG/L			5	
SWB5	29-May-90	TSS	15	MG/L			5	
SWB5	29-May-90	TSS	15	MG/L			5	
SWB5	30-May-90	TSS	56	MG/L			5	
Maximum			1600					
Minimum			3					
Mean			31.440388					
Standard Dev			125.89941					

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MEASURED TSS ALONG N. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L	Validation
SW003	26-Jun-89	TSS	14	MG/L			V	
SW003	18-Aug-89	TSS	34	MG/L				
SW003	7-Sep-89	TSS	12	MG/L			A	
SW003	3-Oct-89	TSS	8	MG/L			A	
SW003	3-Nov-89	TSS	16	MG/L			A	
SW003	12-Jan-90	TSS	14	MG/L			A	
SW003	12-Jan-90	TSS	14	MG/L				
SW003	12-Feb-90	TSS	32	MG/L				
SW003	12-Feb-90	TSS	32	MG/L				
SW003	17-Mar-90	TSS	9	MG/L			V	
SW003	30-Mar-90	TSS	17	MG/L		5		
SW003	30-Mar-90	TSS	17	MG/L		5		
SW003	5-Apr-90	TSS	11	MG/L		5		
SW003	5-Apr-90	TSS	11	MG/L		5		
SW003	12-Apr-90	TSS	17	MG/L		5		
SW003	12-Apr-90	TSS	17	MG/L		5		
SW003	19-Apr-90	TSS	16	MG/L		5		
SW003	19-Apr-90	TSS	16	MG/L		5		
SW003	26-Apr-90	TSS	19	MG/L		5		
SW003	26-Apr-90	TSS	19	MG/L		5		
SW003	3-May-90	TSS	11	MG/L		5		
SW003	3-May-90	TSS	11	MG/L		5		
SW003	10-May-90	TSS	10	MG/L	U	10		
SW003	10-May-90	TSS	10	MG/L	U	10		
SW003	15-May-90	TSS	5.5	MG/L		5		
SW003	15-May-90	TSS	5.5	MG/L		5		
SW003	22-May-90	TSS	5	MG/L	U	5		
SW003	24-May-90	TSS	28	MG/L		10	V	
SW003	29-May-90	TSS	5	MG/L	U	5		
SW003	29-May-90	TSS	5	MG/L	U	5		
SW003	28-Aug-90	TSS	11	MG/L		2		
SW003	24-Sep-90	TSS	6	MG/L		2		
SW003	24-Sep-90	TSS	5	MG/L		4		
SW003	17-Oct-90	TSS	9	MG/L		4		
SW003	31-Oct-90	TSS	12	MG/L		2	Z	
SW003	15-Nov-90	TSS	2	MG/L	U	2	Z	
SW003	5-Dec-90	TSS	35	MG/L		2		
SW003	25-Feb-91	TSS	2	MG/L	U	2		
SW003	19-Mar-91	TSS	2	MG/L		2		
SW003	17-Apr-91	TSS	10	MG/L		2		
SW003	21-May-91	TSS	15	MG/L		2		
SW003	19-Jun-91	TSS	19	MG/L		2		
SW003	22-Jul-91	TSS	29	MG/L		2		
SW003	21-Aug-91	TSS	12	MG/L		2		
SW003	7-Jan-92	TSS	10	MG/L		5	Z	
SW003	6-Feb-92	TSS	5	MG/L	U	5	V	
	Max		35					
	Min		2					
	Mean		13.59					

	Median		11.5					
SW016	26-Jun-89	TSS	5	MG/L			V	
SW016	17-Jul-89	TSS	5	MG/L	UJ		A	
SW016	10-Aug-89	TSS	6	MG/L				
SW016	25-Aug-89	TSS	5	MG/L	UJ		A	
SW016	6-Sep-89	TSS	5	MG/L	UJ		A	
SW016	3-Oct-89	TSS	5	MG/L	U		A	
SW016	17-Oct-89	TSS	50	MG/L			A	
SW016	17-Mar-90	TSS	14	MG/L			V	
SW016	24-May-90	TSS	5	MG/L	U	10	V	
SW016	26-Jun-90	TSS	9	MG/L		5		
SW016	24-Jul-90	TSS	11	MG/L		4		
SW016	23-Aug-90	TSS	4	MG/L	U	4		
SW016	24-Sep-90	TSS	4	MG/L	U	4		
SW016	24-Sep-90	TSS	4	MG/L	U	4		
	Max		50					
	Min		4					
	Mean		9.43					
	Median		5					
SW017	25-Oct-90	TSS	4	MG/L				
SW017	28-Nov-90	TSS	4	MG/L	U	4		
SW017	12-Dec-90	TSS	6	MG/L		4		
SW017	14-Mar-91	TSS	5	MG/L	U		V	
SW017	11-Apr-91	TSS	300	MG/L		4	JA	
SW017	22-May-91	TSS	17	MG/L		5	V	
SW017	26-Jun-91	TSS	5	MG/L	U	5	V	
SW017	29-Jul-91	TSS	5	MG/L		5	V	
SW017	29-Jul-91	TSS	5	MG/L		5		
SW017	14-Aug-91	TSS	10	MG/L		5	V	
SW017	19-Sep-91	TSS	44	MG/L		5	V	
SW017	19-Sep-91	TSS	44	MG/L		5		
SW017	19-Sep-91	TSS	5	MG/L	U	5	V	
SW017	19-Sep-91	TSS	5	MG/L	U	5		
SW017	28-Oct-91	TSS	4	MG/L	U	4	V	
SW017	26-Feb-92	TSS	2	MG/L		5	V	
	Max		300					
	Min		2					
	Mean		29.06					
	Median		5					
SW092	7-Jul-88	TSS	31	MG/L				
SW092	23-Mar-89	TSS	5	MG/L		UJ		A
SW092	15-May-89	TSS	17	MG/L				A
SW092	9-Jun-89	TSS	8	MG/L				A
SW092	6-Jul-89	TSS	16	MG/L				A
SW092	3-Aug-89	TSS	5	MG/L		UJ		A
SW092	7-Sep-89	TSS	5	MG/L		U		A
SW092	11-Oct-89	TSS	32	MG/L				A
SW092	2-Nov-89	TSS	5	MG/L		U		A

SW092	6-Dec-89	TSS	6	MG/L				
SW092	26-Jan-90	TSS	310	MG/L				
SW092	14-Feb-90	TSS	6	MG/L				V
SW092	13-Mar-90	TSS	180	MG/L				V
SW092	27-Apr-90	TSS	44	MG/L				
SW092	24-May-90	TSS	14	MG/L			10	V
SW092	30-Aug-90	TSS	28	MG/L			4	
SW092	25-Sep-90	TSS	5	MG/L			4	
SW092	17-Oct-90	TSS	4	MG/L		U	4	
SW092	12-Dec-90	TSS	5	MG/L			4	
SW092	14-Mar-91	TSS	5	MG/L		U	5	
SW092	15-Apr-91	TSS	10	MG/L			5	
SW092	21-May-91	TSS	5	MG/L		U	5	V
SW092	26-Jun-91	TSS	7	MG/L			5	V
SW092	9-Jul-91	TSS	8	MG/L			5	V
SW092	15-Aug-91	TSS	13	MG/L			5	V
SW092	25-Sep-91	TSS	5	MG/L		U	5	V
SW092	29-Oct-91	TSS	5	MG/L		U	5	V
SW092	6-Feb-92	TSS	11	MG/L			5	V
SW098	20-Jun-88	TSS	8	MG/L				
SW098	19-May-89	TSS	10	MG/L				A
SW098	6-Jul-89	TSS	7	MG/L				A
SW098	2-Aug-89	TSS	6	MG/L				V
SW098	6-Sep-89	TSS	5	MG/L		U		A
SW098	9-Oct-89	TSS	5	MG/L		U		A
SW098	2-Nov-89	TSS	5	MG/L		U		A
SW098	6-Dec-89	TSS	8	MG/L				
SW098	12-Jan-90	TSS	20	MG/L				A
SW098	13-Feb-90	TSS	8	MG/L				V
SW098	16-Mar-90	TSS	8	MG/L				
SW098	30-Aug-90	TSS	6	MG/L			4	
SW098	28-Sep-90	TSS	5000	MG/L			4	
SW098	28-Sep-90	TSS	110	MG/L			4	
SW098	25-Oct-90	TSS	10	MG/L				
SW098	14-Nov-90	TSS	2	MG/L				
SW098	5-Dec-90	TSS	1	MG/L		U		
SW098	3-Jan-91	TSS	4	MG/L		U	4	
SW098	22-Jan-91	TSS	731	MG/L				
SW098	25-Mar-91	TSS	5	MG/L		U	5	V
SW098	9-Apr-91	TSS	5	MG/L		U	5	
SW098	7-May-91	TSS	6	MG/L			5	V
SW098	20-Jun-91	TSS	5	MG/L		U	5	
SW098	15-Jul-91	TSS	75	MG/L				
SW098	23-Jul-91	TSS	5	MG/L		U	5	
SW098	23-Jul-91	TSS	5	MG/L		U		V
SW098	15-Aug-91	TSS	5	MG/L		U	5	V
SW098	15-Aug-91	TSS	7	MG/L			5	V
SW098	18-Sep-91	TSS	5	MG/L		U	5	V
SW098	18-Sep-91	TSS	5	MG/L		U	5	V
SW098	14-Oct-91	TSS	828	MG/L				

MEASURED TSS ALONG N. WALNUT CREEK

SW098	16-Oct-91	TSS	12	MG/L			5	V
SW098	21-Jan-92	TSS	847	MG/L				
SW098	2-Mar-92	TSS	5	MG/L		U	5	V
SW098	2-Mar-92	TSS	5	MG/L		U	5	V
SW098	10-Apr-92	TSS	4	MG/L		U		Z
SW098	13-Apr-92	TSS	4	MG/L		U		Z
SW098	9-Sep-92	TSS	5	MG/L		U	5	Z
SW098	25-Jan-93	TSS	5	MG/L		U	5	V
SW098	26-Feb-93	TSS	5	MG/L		U	5	V
SW098	24-Mar-93	TSS	5	MG/L		U	5	V
SW102	8-Jul-88	TSS	58	MG/L				
SW102	12-Sep-89	TSS	5	MG/L		UJ		A
SW102	20-Mar-90	TSS	6600	MG/L				V
SW102	16-Apr-90	TSS	360	MG/L			10	V
SW102	7-May-90	TSS	220	MG/L				
SW102	26-Jun-90	TSS	13	MG/L			5	
SW106	13-Apr-89	TSS	10	MG/L				A
SW106	9-May-89	TSS	5	MG/L		U		A
SW106	7-Jun-89	TSS	5	MG/L		U		A
SW106	21-Mar-90	TSS	5	MG/L		U		
SW113	17-Aug-89	TSS	26	MG/L				
SW113	25-Aug-89	TSS	26	MG/L				A
SW113	18-Oct-89	TSS	30	MG/L				
SW118	29-Oct-90	TSS	17	MG/L			4	
SW118	27-Nov-90	TSS	4	MG/L		U	4	
SW118	13-Dec-90	TSS	9	MG/L			4	
SW118	21-Mar-91	TSS	5	MG/L		U	5	V
SW118	10-Apr-91	TSS	9	MG/L			5	
SW118	1-May-91	TSS	400	MG/L			2	
SW118	9-May-91	TSS	5	MG/L		U	5	V
SW118	17-May-91	TSS	2140	MG/L			2	
SW118	28-May-91	TSS	880	MG/L			2	
SW118	3-Jun-91	TSS	8200	MG/L			4	JA 1
SW118	11-Jun-91	TSS	3000	MG/L			4	JA 1
SW118	26-Jun-91	TSS	28	MG/L			5	V
SW118	29-Jul-91	TSS	6	MG/L			5	
SW118	7-Aug-91	TSS	8	MG/L			5	V
SW118	12-Mar-92	TSS	30	MG/L			5	V
SW68593	17-May-93	TSS	1900	MG/L			4	V
SW68693	17-May-93	TSS	55	MG/L			4	V
SW68793	17-May-93	TSS	250	MG/L			4	V
SW68893	17-May-93	TSS	390	MG/L			4	V
SW68993	17-May-93	TSS	60	MG/L			4	V
SW69093	17-May-93	TSS	21500	MG/L			4	V
SW69293	17-May-93	TSS	140	MG/L			4	V
SW69393	17-May-93	TSS	190	MG/L			4	V

MEASURED TSS ALONG N. WALNUT CREEK

SWA1	14-Jul-89	TSS	5	MG/L		U		
SWA1	14-Jul-89	TSS	5	MG/L		U		
SWA1	14-Jul-89	TSS	5	MG/L		U		
SWA1	24-Aug-89	TSS	22	MG/L				A
SWA1	24-Aug-89	TSS	34	MG/L				A
SWA1	24-Aug-89	TSS	24	MG/L				A
SWA2	12-Jul-89	TSS	7	MG/L				
SWA2	13-Jul-89	TSS	6	MG/L				
SWA2	13-Jul-89	TSS	22	MG/L				
SWA2	13-Jul-89	TSS	10	MG/L				
SWA2	23-Aug-89	TSS	5	MG/L			U	
SWA2	23-Aug-89	TSS	10	MG/L				
SWA2	23-Aug-89	TSS	12	MG/L				
SWA3	12-Jul-89	TSS	21	MG/L				
SWA3	12-Jul-89	TSS	24	MG/L				
SWA3	12-Jul-89	TSS	15	MG/L				
SWA3	12-Jul-89	TSS	24	MG/L				
SWA3	23-Aug-89	TSS	5	MG/L		U		
SWA3	23-Aug-89	TSS	18	MG/L				
SWA3	23-Aug-89	TSS	10	MG/L				
SWA3	23-Aug-89	TSS	10	MG/L				
SWA3	23-Aug-89	TSS	12	MG/L				
SWA3	29-Mar-90	TSS	5	MG/L		U	5	
SWA3	30-Mar-90	TSS	5	MG/L		U	5	
SWA3	30-Mar-90	TSS	20	MG/L			10	
SWA3	31-Mar-90	TSS	5	MG/L		U	5	
SWA3	31-Mar-90	TSS	5	MG/L		U	5	
SWA3	1-Apr-90	TSS	5	MG/L			5	V
SWA3	2-Apr-90	TSS	6	MG/L			5	V
SWA3	3-Apr-90	TSS	5	MG/L		U	5	
SWA3	4-Apr-90	TSS	8	MG/L			5	
SWA3	5-Apr-90	TSS	5	MG/L		U	5	
SWA3	6-Apr-90	TSS	12	MG/L			5	
SWA3	6-Apr-90	TSS	9	MG/L			5	
SWA3	7-Apr-90	TSS	16	MG/L			5	
SWA3	8-Apr-90	TSS	5	MG/L			5	
SWA3	9-Apr-90	TSS	5	MG/L			5	
SWA3	10-Apr-90	TSS	5	MG/L			5	
SWA3	11-Apr-90	TSS	5	MG/L		U	5	
SWA3	12-Apr-90	TSS	8	MG/L			5	
SWA3	13-Apr-90	TSS	5	MG/L		U	5	
SWA3	14-Apr-90	TSS	7	MG/L			5	
SWA3	16-Apr-90	TSS	5	MG/L			5	
SWA3	17-Apr-90	TSS	5	MG/L		U	5	
SWA3	18-Apr-90	TSS	5	MG/L		U	5	
SWA3	19-Apr-90	TSS	5	MG/L		U	5	
SWA3	20-Apr-90	TSS	5	MG/L		U	5	
SWA3	21-Apr-90	TSS	5	MG/L		U	5	

MEASURED TSS ALONG N. WALNUT CREEK

SWA3	22-Apr-90	TSS	5	MG/L		U	5	
SWA3	23-Apr-90	TSS	5	MG/L		U	5	
SWA3	24-Apr-90	TSS	5	MG/L		U	5	
SWA3	25-Apr-90	TSS	5	MG/L			5	
SWA3	26-Apr-90	TSS	5	MG/L		U	5	
SWA3	27-Apr-90	TSS	16.5	MG/L			5	
SWA3	28-Apr-90	TSS	152	MG/L			5	
SWA3	29-Apr-90	TSS	10	MG/L			5	
SWA3	30-Apr-90	TSS	13.5	MG/L			5	
SWA3	1-May-90	TSS	5	MG/L		U	5	
SWA3	2-May-90	TSS	9.5	MG/L			5	
SWA3	3-May-90	TSS	31	MG/L			5	
SWA3	4-May-90	TSS	27	MG/L			5	
SWA3	5-May-90	TSS	19.5	MG/L			5	
SWA3	6-May-90	TSS	21	MG/L			5	
SWA4	10-Jul-89	TSS	11	MG/L				
SWA4	11-Jul-89	TSS	5	MG/L		U		
SWA4	11-Jul-89	TSS	9	MG/L				
SWA4	11-Jul-89	TSS	5	MG/L		U		
SWA4	11-Jul-89	TSS	5	MG/L		U		
SWA4	11-Jul-89	TSS	10	MG/L				
SWA4	31-Jul-89	TSS	5	MG/L		U		A
SWA4	1-Aug-89	TSS	5	MG/L		U		A
SWA4	1-Aug-89	TSS	5	MG/L		U		V
SWA4	22-Aug-89	TSS	5	MG/L		U		
SWA4	22-Aug-89	TSS	5	MG/L		U		
SWA4	22-Aug-89	TSS	5	MG/L		U		
SWA4	29-Mar-90	TSS	5	MG/L		U	5	
SWA4	29-Mar-90	TSS	5	MG/L		U	5	
SWA4	30-Mar-90	TSS	5	MG/L		U	5	
SWA4	30-Mar-90	TSS	20	MG/L			10	
SWA4	30-Mar-90	TSS	5	MG/L		U	5	
SWA4	30-Mar-90	TSS	20	MG/L			10	
SWA4	31-Mar-90	TSS	5	MG/L		U	5	
SWA4	31-Mar-90	TSS	5	MG/L		U	5	
SWA4	1-Apr-90	TSS	11	MG/L			5	V
SWA4	1-Apr-90	TSS	6	MG/L			5	V
SWA4	2-Apr-90	TSS	15	MG/L			5	V
SWA4	2-Apr-90	TSS	9	MG/L			5	V
SWA4	3-Apr-90	TSS	19	MG/L			5	
SWA4	3-Apr-90	TSS	9.5	MG/L			5	
SWA4	4-Apr-90	TSS	26	MG/L			5	
SWA4	4-Apr-90	TSS	30	MG/L			5	
SWA4	5-Apr-90	TSS	19	MG/L			5	
SWA4	5-Apr-90	TSS	15	MG/L			5	
SWA4	5-Apr-90	TSS	17	MG/L			5	
SWA4	6-Apr-90	TSS	18	MG/L			5	
SWA4	6-Apr-90	TSS	20	MG/L			5	
SWA4	6-Apr-90	TSS	14	MG/L			5	
SWA4	6-Apr-90	TSS	16	MG/L			5	

MEASURED TSS ALONG N. WALNUT CREEK

SWA4	7-Apr-90	TSS	21	MG/L				5	
SWA4	7-Apr-90	TSS	10	MG/L				5	
SWA4	8-Apr-90	TSS	20	MG/L				5	
SWA4	8-Apr-90	TSS	17.5	MG/L				5	
SWA4	8-Apr-90	TSS	20.5	MG/L				5	
SWA4	9-Apr-90	TSS	37	MG/L				5	
SWA4	9-Apr-90	TSS	16	MG/L				5	
SWA4	9-Apr-90	TSS	17	MG/L				5	
SWA4	10-Apr-90	TSS	24.5	MG/L				5	
SWA4	10-Apr-90	TSS	14.5	MG/L				5	
SWA4	10-Apr-90	TSS	11.5	MG/L				5	
SWA4	11-Apr-90	TSS	20.5	MG/L				5	
SWA4	11-Apr-90	TSS	15	MG/L				5	
SWA4	11-Apr-90	TSS	21.5	MG/L				5	
SWA4	12-Apr-90	TSS	32	MG/L				5	
SWA4	12-Apr-90	TSS	17	MG/L				5	
SWA4	12-Apr-90	TSS	16	MG/L				5	
SWA4	13-Apr-90	TSS	6	MG/L				5	
SWA4	13-Apr-90	TSS	9	MG/L				5	
SWA4	13-Apr-90	TSS	22	MG/L				5	
SWA4	14-Apr-90	TSS	19	MG/L				5	
SWA4	14-Apr-90	TSS	5	MG/L				5	
SWA4	14-Apr-90	TSS	13	MG/L				5	
SWA4	16-Apr-90	TSS	21.5	MG/L				5	
SWA4	16-Apr-90	TSS	17	MG/L				5	
SWA4	16-Apr-90	TSS	31	MG/L				5	
SWA4	17-Apr-90	TSS	20	MG/L				5	
SWA4	17-Apr-90	TSS	12	MG/L				5	
SWA4	17-Apr-90	TSS	17.5	MG/L				5	
SWA4	18-Apr-90	TSS	19	MG/L				5	
SWA4	18-Apr-90	TSS	11	MG/L				5	
SWA4	18-Apr-90	TSS	23.5	MG/L				5	
SWA4	19-Apr-90	TSS	20.5	MG/L				5	
SWA4	19-Apr-90	TSS	16	MG/L				5	
SWA4	19-Apr-90	TSS	18.5	MG/L				5	
SWA4	20-Apr-90	TSS	20.5	MG/L				5	
SWA4	20-Apr-90	TSS	15.5	MG/L				5	
SWA4	20-Apr-90	TSS	21	MG/L				5	
SWA4	21-Apr-90	TSS	11.5	MG/L				5	
SWA4	21-Apr-90	TSS	54.5	MG/L				5	
SWA4	22-Apr-90	TSS	11.5	MG/L				5	
SWA4	22-Apr-90	TSS	13.5	MG/L				5	
SWA4	22-Apr-90	TSS	19.5	MG/L				5	
SWA4	23-Apr-90	TSS	16	MG/L				5	
SWA4	23-Apr-90	TSS	22.5	MG/L				5	
SWA4	23-Apr-90	TSS	10	MG/L				5	
SWA4	23-Apr-90	TSS	7	MG/L				5	
SWA4	23-Apr-90	TSS	16	MG/L				5	
SWA4	24-Apr-90	TSS	11	MG/L				5	
SWA4	24-Apr-90	TSS	12.5	MG/L				5	
SWA4	24-Apr-90	TSS	6	MG/L				5	

MEASURED TSS ALONG N. WALNUT CREEK

SWA4	24-Apr-90	TSS	7.5	MG/L			5	
SWA4	24-Apr-90	TSS	10.5	MG/L			5	
SWA4	25-Apr-90	TSS	14	MG/L			5	
SWA4	25-Apr-90	TSS	5	MG/L		U	5	
SWA4	25-Apr-90	TSS	6	MG/L			5	
SWA4	25-Apr-90	TSS	9.5	MG/L			5	
SWA4	25-Apr-90	TSS	6	MG/L			5	
SWA4	25-Apr-90	TSS	11	MG/L			5	
SWA4	25-Apr-90	TSS	9.5	MG/L			5	
SWA4	26-Apr-90	TSS	5	MG/L		U	5	
SWA4	26-Apr-90	TSS	5	MG/L		U	5	
SWA4	26-Apr-90	TSS	5	MG/L		U	5	
SWA4	26-Apr-90	TSS	5	MG/L		U	5	
SWA4	26-Apr-90	TSS	5	MG/L		U	5	
SWA4	26-Apr-90	TSS	5	MG/L		U	5	
SWA4	26-Apr-90	TSS	5	MG/L		U	5	
SWA4	27-Apr-90	TSS	5	MG/L			5	
SWA4	27-Apr-90	TSS	5	MG/L		U	5	
SWA4	27-Apr-90	TSS	5	MG/L		U	5	
SWA4	27-Apr-90	TSS	5	MG/L		U	5	
SWA4	27-Apr-90	TSS	5	MG/L		U	5	
SWA4	27-Apr-90	TSS	5	MG/L		U	5	
SWA4	27-Apr-90	TSS	5	MG/L		U	5	
SWA4	28-Apr-90	TSS	5	MG/L		U	5	
SWA4	28-Apr-90	TSS	5	MG/L		U	5	
SWA4	28-Apr-90	TSS	5	MG/L		U	5	
SWA4	28-Apr-90	TSS	5	MG/L		U	5	
SWA4	28-Apr-90	TSS	46.5	MG/L			5	
SWA4	28-Apr-90	TSS	5	MG/L		U	5	
SWA4	28-Apr-90	TSS	5	MG/L		U	5	
SWA4	29-Apr-90	TSS	5	MG/L		U	5	
SWA4	29-Apr-90	TSS	5	MG/L		U	5	
SWA4	29-Apr-90	TSS	5	MG/L		U	5	
SWA4	29-Apr-90	TSS	5	MG/L		U	5	
SWA4	29-Apr-90	TSS	5	MG/L		U	5	
SWA4	29-Apr-90	TSS	5	MG/L		U	5	
SWA4	29-Apr-90	TSS	5	MG/L		U	5	
SWA4	30-Apr-90	TSS	5	MG/L		U	5	
SWA4	30-Apr-90	TSS	5	MG/L		U	5	
SWA4	30-Apr-90	TSS	5	MG/L		U	5	
SWA4	30-Apr-90	TSS	5	MG/L		U	5	
SWA4	30-Apr-90	TSS	5	MG/L		U	5	
SWA4	30-Apr-90	TSS	5	MG/L			5	
SWA4	30-Apr-90	TSS	5	MG/L		U	5	
SWA4	1-May-90	TSS	5	MG/L		U	5	
SWA4	1-May-90	TSS	5	MG/L		U	5	
SWA4	1-May-90	TSS	5	MG/L		U	5	
SWA4	1-May-90	TSS	5	MG/L		U	5	
SWA4	1-May-90	TSS	5	MG/L		U	5	
SWA4	1-May-90	TSS	5	MG/L		U	5	
SWA4	2-May-90	TSS	5	MG/L		U	5	

MEASURED TSS ALONG N. WALNUT CREEK

SWA4	2-May-90	TSS	5	MG/L		U	5	
SWA4	2-May-90	TSS	5	MG/L		U	5	
SWA4	2-May-90	TSS	5	MG/L		U	5	
SWA4	2-May-90	TSS	5	MG/L		U	5	
SWA4	3-May-90	TSS	5	MG/L		U	5	
SWA4	3-May-90	TSS	5	MG/L		U	5	
SWA4	3-May-90	TSS	5	MG/L		U	5	
SWA4	3-May-90	TSS	5	MG/L		U	5	
SWA4	3-May-90	TSS	7	MG/L			5	
SWA4	3-May-90	TSS	5	MG/L			5	
SWA4	4-May-90	TSS	5	MG/L		U	5	
SWA4	4-May-90	TSS	5	MG/L		U	5	
SWA4	4-May-90	TSS	21.5	MG/L			5	
SWA4	4-May-90	TSS	5	MG/L		U	5	
SWA4	4-May-90	TSS	5	MG/L		U	5	
SWA4	5-May-90	TSS	5	MG/L			5	
SWA4	5-May-90	TSS	5	MG/L		U	5	
SWA4	5-May-90	TSS	5	MG/L		U	5	
SWA4	5-May-90	TSS	5	MG/L		U	5	
SWA4	6-May-90	TSS	5	MG/L		U	5	
SWA4	6-May-90	TSS	5	MG/L		U	5	
SWA4	6-May-90	TSS	5	MG/L		U	5	
SWA4	6-May-90	TSS	5	MG/L		U	5	
SWA4	7-May-90	TSS	5	MG/L		U	5	
SWA4	7-May-90	TSS	5	MG/L		U	5	
SWA4	7-May-90	TSS	5	MG/L		U	5	
SWA4	7-May-90	TSS	6	MG/L			5	
SWA4	7-May-90	TSS	5	MG/L		U	5	
SWA4	8-May-90	TSS	6	MG/L			5	
SWA4	8-May-90	TSS	5	MG/L		U	5	
SWA4	8-May-90	TSS	5	MG/L		U	5	
SWA4	8-May-90	TSS	6	MG/L			5	
SWA4	8-May-90	TSS	6	MG/L			5	
SWA4	9-May-90	TSS	5	MG/L		U	5	
SWA4	9-May-90	TSS	5	MG/L		U	5	
SWA4	9-May-90	TSS	10	MG/L			5	
SWA4	10-May-90	TSS	10	MG/L		U	10	
SWA4	10-May-90	TSS	10	MG/L		U	10	
SWA4	11-May-90	TSS	5	MG/L			5	
SWA4	11-May-90	TSS	5	MG/L		U	5	
SWA4	11-May-90	TSS	6	MG/L			5	
SWA4	12-May-90	TSS	6	MG/L			5	
SWA4	12-May-90	TSS	5	MG/L		U	5	
SWA4	12-May-90	TSS	5	MG/L		U	5	
SWA4	13-May-90	TSS	5	MG/L		U	5	
SWA4	13-May-90	TSS	5	MG/L		U	5	
SWA4	13-May-90	TSS	5	MG/L		U	5	
SWA4	14-May-90	TSS	5	MG/L		U	5	
SWA4	14-May-90	TSS	5	MG/L		U	5	
SWA4	15-May-90	TSS	5	MG/L		U	5	
SWA4	15-May-90	TSS	5	MG/L		U	5	

MEASURED TSS ALONG N. WALNUT CREEK

SWA4	15-May-90	TSS	5	MG/L		U	5	
SWA4	16-May-90	TSS	7	MG/L			5	
SWA4	16-May-90	TSS	5	MG/L		U	5	
SWA4	16-May-90	TSS	8	MG/L			5	
SWA4	17-May-90	TSS	14	MG/L			5	
SWA4	17-May-90	TSS	19.5	MG/L			5	
SWA4	17-May-90	TSS	10	MG/L			5	
SWA4	18-May-90	TSS	5	MG/L		U	5	
SWA4	18-May-90	TSS	5	MG/L		U	5	
SWA4	18-May-90	TSS	5	MG/L		U	5	
SWA4	19-May-90	TSS	5	MG/L		U	5	
SWA4	19-May-90	TSS	5	MG/L		U	5	
SWA4	19-May-90	TSS	5	MG/L		U	5	
SWA4	20-May-90	TSS	5	MG/L		U	5	
SWA4	20-May-90	TSS	5	MG/L		U	5	
SWA4	20-May-90	TSS	5	MG/L		U	5	
SWA4	21-May-90	TSS	5	MG/L		U	5	
SWA4	21-May-90	TSS	5	MG/L		U	5	
SWA4	21-May-90	TSS	5	MG/L			5	
SWA4	22-May-90	TSS	10	MG/L		U	10	
SWA4	22-May-90	TSS	10	MG/L		U	10	
SWA4	23-May-90	TSS	5	MG/L			5	
SWA4	23-May-90	TSS	5	MG/L		U	5	
SWA4	23-May-90	TSS	5	MG/L			5	
SWA4	24-May-90	TSS	5	MG/L		U	5	
SWA4	24-May-90	TSS	5	MG/L		U	5	
SWA4	24-May-90	TSS	5	MG/L		U	5	
SWA4	26-May-90	TSS	5	MG/L		U	5	
SWA4	26-May-90	TSS	5	MG/L		U	5	
SWA4	27-May-90	TSS	5	MG/L			5	
SWA4	27-May-90	TSS	5	MG/L		U	5	
SWA4	27-May-90	TSS	5	MG/L		U	5	
SWA4	28-May-90	TSS	5	MG/L		U	5	
SWA4	28-May-90	TSS	5	MG/L		U	5	
SWA4	28-May-90	TSS	5	MG/L		U	5	
SWA4	29-May-90	TSS	5	MG/L		U	5	
SWA4	29-May-90	TSS	5	MG/L		U	5	
SWA4	29-May-90	TSS	5	MG/L		U	5	
SWA4	29-May-90	TSS	5	MG/L		U	5	
SWA4	30-May-90	TSS	8	MG/L			5	
Maximum			21500					
Minimum			1					
Mean			146.88258					
Standard Dev			1242.9571					
Geometric Mean			9.521156					

MEASURED AMERICIUM-241 CONCENTRATION ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SW023	19-Aug-86	AMERICIUM-241	0	PCI/L	0.02		
SW023	16-Oct-90	AMERICIUM-241	0.04322	PCI/L	0.0171147		
SW023	16-Nov-90	AMERICIUM-241	0	PCI/L	0.65	U	0.025
SW023	4-Dec-90	AMERICIUM-241	4	PCI/L		U	0.01
SW023	4-Dec-90	AMERICIUM-241	0	PCI/L	0	U	3.5
SW023	4-Dec-90	AMERICIUM-241	0.002	PCI/L	0.007	U	0.01
SW023	4-Dec-90	AMERICIUM-241	0.01	PCI/L		U	0.01
SW023	14-Jan-91	AMERICIUM-241	0	PCI/L	0.352	U	0.352
SW023	28-Mar-91	AMERICIUM-241	0.059	PCI/L	0.072	U	0
SW023	28-Mar-91	AMERICIUM-241	0.027	PCI/L	0.023	U	0.34
SW023	17-Apr-91	AMERICIUM-241	0.17	PCI/L	0.92		
SW023	17-Apr-91	AMERICIUM-241	2	PCI/L		U	0.01
SW023	17-Apr-91	AMERICIUM-241	-0.03	PCI/L	0.236		0.475
SW023	17-Apr-91	AMERICIUM-241	0.5	PCI/L		U	0.01
SW023	20-May-91	AMERICIUM-241	0.008891	PCI/L	0.00658	J	0
SW023	25-Jun-91	AMERICIUM-241	0.001574	PCI/L	0.00306	J	0.005
SW023	17-Jul-91	AMERICIUM-241	0.001189	PCI/L	0.00238	J	0
SW023	6-Aug-91	AMERICIUM-241	0.003179	PCI/L	0.00406	J	0.01
SW023	16-Sep-91	AMERICIUM-241	0.005	PCI/L	0.004	J	0.004
SW023	16-Sep-91	AMERICIUM-241	0	PCI/L	0.005	U	0.013
SW023	16-Sep-91	AMERICIUM-241	0.004	PCI/L	0.006	U	0.006
SW023	15-Oct-91	AMERICIUM-241	0.003	PCI/L	0.006	U	0.008
SW023	20-Jan-92	AMERICIUM-241	0.004	PCI/L	0.01	U	0.013
SW023	23-Apr-92	AMERICIUM-241	0	PCI/L	0	U	0.01
Maximum			**4**				
Minimum			**-0.03**				
Mean			**0.24**				
SW024	19-Aug-86	AMERICIUM-241	0.01	PCI/L	0.02		
Maximum			**0.01**				
Minimum			**0.01**				
Mean			**0.01**				
SW061	22-Jul-87	AMERICIUM-241	0	PCI/L	1.2		
SW061	20-Mar-89	AMERICIUM-241	0.03	PCI/L	0.02		
SW061	20-Mar-89	AMERICIUM-241	0	PCI/L	0.02		
SW061	15-May-89	AMERICIUM-241	0.01	PCI/L	0.01		
SW061	9-Jun-89	AMERICIUM-241	0.05	PCI/L	0.03		
SW061	6-Jul-89	AMERICIUM-241	0.01	PCI/L	0.01		
SW061	3-Aug-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
SW061	11-Sep-89	AMERICIUM-241	0.019	PCI/L	0.012		0.01
SW061	3-Oct-89	AMERICIUM-241	0.033	PCI/L	0.016		0
SW061	6-Nov-89	AMERICIUM-241	0.013	PCI/L	0.011		0.009
SW061	6-Nov-89	AMERICIUM-241	0.013	PCI/L	0.011		0.009
SW061	6-Dec-89	AMERICIUM-241	0.003	PCI/L	0.006		0.006
SW061	23-Jan-90	AMERICIUM-241	0.067	PCI/L	0.015		0.005
SW061	23-Jan-90	AMERICIUM-241	0.067	PCI/L	0.015		0.005
SW061	9-Feb-90	AMERICIUM-241	0.3	PCI/L	0.042		0
SW061	23-May-90	AMERICIUM-241	0.01	PCI/L	0.007		0.005
SW061	18-Jun-90	AMERICIUM-241	0.011	PCI/L	0.01		0.009
SW061	18-Jun-90	AMERICIUM-241	0.016	PCI/L	0.008		0.005

MEASURED AMERICIUM-241 CONCENTRATION ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SW061	23-Jul-90	AMERICIUM-241	0.006902	PCI/L	0.00415	J	0.01
SW061	22-Aug-90	AMERICIUM-241	0.0148	PCI/L	0.008722		0.007
SW061	19-Sep-90	AMERICIUM-241	0.01676	PCI/L	0.0109917		0.007
SW061	17-Oct-90	AMERICIUM-241	0.01125	PCI/L	0.0122676		0.013
SW061	26-Nov-90	AMERICIUM-241	0.39	PCI/L	0.3	U	0
SW061	7-Dec-90	AMERICIUM-241	0.06	PCI/L		U	0.01
SW061	7-Dec-90	AMERICIUM-241	0.024	PCI/L	0.047	U	0.056
SW061	27-Mar-91	AMERICIUM-241	0	PCI/L	0.001	U	0.015
SW061	11-Apr-91	AMERICIUM-241	0.019	PCI/L	0.022	U	0.034
SW061	8-May-91	AMERICIUM-241	0.476	PCI/L	1.23	U	2.215
SW061	8-May-91	AMERICIUM-241	0.52	PCI/L	1.24		0.01
SW061	20-Jun-91	AMERICIUM-241	0.02204	PCI/L	0.0125		0
SW061	12-Jul-91	AMERICIUM-241	0.009	PCI/L	0.0318		0
SW061	7-Aug-91	AMERICIUM-241	0.0009763	PCI/L	0.00269	J	0
SW061	17-Sep-91	AMERICIUM-241	-0.003	PCI/L	0.009	U	0.018
SW061	17-Oct-91	AMERICIUM-241	0.007	PCI/L	0.008	J	0.006
SW061	17-Oct-91	AMERICIUM-241	0.008	PCI/L	0.006	J	0.002
SW061	17-Oct-91	AMERICIUM-241	0.015	PCI/L	0.014		0.012
SW061	17-Oct-91	AMERICIUM-241	0.009	PCI/L	0.01	J	0.008
SW061	27-Jan-92	AMERICIUM-241	0.005	PCI/L	0.008	J	0.004
SW061	6-Apr-92	AMERICIUM-241	0.004	PCI/L	0.005	J	0.01
SW061	22-Apr-92	AMERICIUM-241	0	PCI/L	0	U	0.01
SW061	27-Apr-92	AMERICIUM-241	0	PCI/L	0	U	0.01
SW061	6-May-92	AMERICIUM-241	0.019	PCI/L	0.008		0.01
SW061	20-May-92	AMERICIUM-241	1.326	PCI/L	0.202		0.01
SW061	4-Jun-92	AMERICIUM-241	0	PCI/L	0	U	0.01
SW061	17-Jun-92	AMERICIUM-241	0.001	PCI/L	0.004	J	0.01
SW061	2-Jul-92	AMERICIUM-241	0.005	PCI/L	0.006	U	0.008
SW061	15-Jul-92	AMERICIUM-241	0.012	PCI/L	0.008		0.01
SW061	29-Jul-92	AMERICIUM-241	0.028	PCI/L	0.012		0.019
SW061	12-Aug-92	AMERICIUM-241	0.003583	PCI/L	0.00415	J	0
SW061	20-Aug-92	AMERICIUM-241	0.04781	PCI/L	0.017		0.006
SW061	26-Aug-92	AMERICIUM-241	-0.0014	PCI/L	-0.011	U	0.01
SW061	26-Aug-92	AMERICIUM-241	0.007	PCI/L	0.017	J	0.01
SW061	8-Sep-92	AMERICIUM-241	-0.005	PCI/L	0.01	U	0.02
SW061	22-Sep-92	AMERICIUM-241	-0.003	PCI/L	0.017	U	0.03
SW061	7-Oct-92	AMERICIUM-241	0.006	PCI/L	0.016	U	0.03
SW061	21-Oct-92	AMERICIUM-241	0.02379	PCI/L	0.00982		0
SW061	6-Nov-92	AMERICIUM-241	0.007618	PCI/L	0.00544	J	0
SW061	17-Nov-92	AMERICIUM-241	0.013	PCI/L	0.00762		0.00303
SW061	3-Dec-92	AMERICIUM-241	0.007149	PCI/L	0.00542	J	0
SW061	3-Dec-92	AMERICIUM-241	0.00823	PCI/L	0.00628	J	0
SW061	6-Jan-93	AMERICIUM-241	0.01754	PCI/L	0.0087		0
SW061	13-Jan-93	AMERICIUM-241	0.015	PCI/L	0.00902		0.00374
SW061	27-Jan-93	AMERICIUM-241	0.029	PCI/L	0.00826		0.00514
SW061	9-Feb-93	AMERICIUM-241	0.03	PCI/L	0.007		0.00292
SW061	24-Feb-93	AMERICIUM-241	0.016	PCI/L	0.00645		0.00528
SW061	12-Mar-93	AMERICIUM-241	0.1539	PCI/L	0.0377		0.009
SW061	23-Mar-93	AMERICIUM-241	0.005362	PCI/L	0.00663	J	0.01

MEASURED AMERICIUM-241 CONCENTRATION ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SW061	7-Apr-93	AMERICIUM-241	-0.001	PCI/L	0.006	U	0.004
SW061	22-Apr-93	AMERICIUM-241	0.1018	PCI/L	0.0248		0.0032799
SW061	5-May-93	AMERICIUM-241	0.02574	PCI/L	0.0103		0.0025798
SW061	19-May-93	AMERICIUM-241	0.016	PCI/L	0.008	B	0.001
SW061	2-Jun-93	AMERICIUM-241	0.01	PCI/L	0.00557		0.00588
SW061	16-Jun-93	AMERICIUM-241	0.004	PCI/L	0.004	U	0.006
SW061	30-Jun-93	AMERICIUM-241	0.009	PCI/L	0.006	J	0.008
SW061	14-Jul-93	AMERICIUM-241	0.012	PCI/L	0.006		0.005
SW061	28-Jul-93	AMERICIUM-241	0.008	PCI/L	0.005	J	0.006
SW061	11-Aug-93	AMERICIUM-241	0.006	PCI/L	0.007	U	0.01
SW061	27-Aug-93	AMERICIUM-241	0.007	PCI/L	0.005	U	0.01
SW061	8-Sep-93	AMERICIUM-241	0.006	PCI/L	0.007	U	0.01
SW061	21-Sep-93	AMERICIUM-241	0.009	PCI/L	0.008	U	0.01
SW061	28-Sep-93	AMERICIUM-241	0.006	PCI/L	0.006	J	0.006
SW061	5-Oct-93	AMERICIUM-241	0.057	PCI/L	0.015		0.008
SW061	13-Oct-93	AMERICIUM-241	0.012	PCI/L	0.005		0.004
SW061	19-Oct-93	AMERICIUM-241	0.011	PCI/L	0.008		0.01
SW061	28-Oct-93	AMERICIUM-241	0.014	PCI/L	0.008		0.009
SW061	4-Nov-93	AMERICIUM-241	0.018	PCI/L	0.009		0.01
SW061	9-Nov-93	AMERICIUM-241	0.002	PCI/L	0.005	U	0.006
SW061	18-Nov-93	AMERICIUM-241	0.005	PCI/L	0.005	U	0.007
SW061	26-Nov-93	AMERICIUM-241	0.004	PCI/L	0.008	U	0.01
SW061	30-Nov-93	AMERICIUM-241	0.002	PCI/L	0.004	U	0.005
SW061	9-Dec-93	AMERICIUM-241	0.005	PCI/L	0.005	J	0.005
SW061	16-Dec-93	AMERICIUM-241	0.008	PCI/L	0.006	J	0.007
SW061	23-Dec-93	AMERICIUM-241	0.005	PCI/L	0.005	U	0.008
SW061	27-Dec-93	AMERICIUM-241	0.001	PCI/L	0.007	U	0.01
SW061	6-Jan-94	AMERICIUM-241	0.001	PCI/L	0.003	U	0.005
SW061	13-Jan-94	AMERICIUM-241	0.019	PCI/L	0.007		0.005
SW061	20-Jan-94	AMERICIUM-241	0.018	PCI/L	0.007		0.007
SW061	27-Jan-94	AMERICIUM-241	0.009	PCI/L	0.005	J	0.005
SW061	4-Feb-94	AMERICIUM-241	0.005	PCI/L	0.007	U	0.01
SW061	10-Feb-94	AMERICIUM-241	0.006	PCI/L	0.005	J	0.005
SW061	15-Feb-94	AMERICIUM-241	0.002	PCI/L	0.005	U	0.008
SW061	24-Feb-94	AMERICIUM-241	0.012	PCI/L	0.008		0.01
SW061	3-Mar-94	AMERICIUM-241	0.004	PCI/L	0.007	U	0.01
SW061	10-Mar-94	AMERICIUM-241	-0.002	PCI/L	0.004	U	0.02
SW061	17-Mar-94	AMERICIUM-241	0.004	PCI/L	0.007	U	0.01
SW061	22-Mar-94	AMERICIUM-241	0.003	PCI/L	0.004	U	0.005
SW061	31-Mar-94	AMERICIUM-241	0.022	PCI/L	0.01		0.006
SW061	7-Apr-94	AMERICIUM-241	0.013	PCI/L	0.006	B	0.006
Maximum			**1.326**				
Minimum			**-0.005**				
Mean			**0.042**				
SWB1	16-Aug-86	AMERICIUM-241	-0.01	PCI/L	0.04		
SWB1	7-Jul-89	AMERICIUM-241	0.01	PCI/L	0.01		
SWB1	10-Jul-89	AMERICIUM-241	0.04	PCI/L	0.01		
SWB1	10-Jul-89	AMERICIUM-241	0.05	PCI/L	0.01		

MEASURED AMERICIUM-241 CONCENTRATION ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SWB1	10-Jul-89	AMERICIUM-241	0.06	PCI/L	0.02		
SWB1	10-Jul-89	AMERICIUM-241	0.04	PCI/L	0.01		
SWB1	21-Aug-89	AMERICIUM-241	0.04	PCI/L	0.02		0.01
SWB1	21-Aug-89	AMERICIUM-241	0.08	PCI/L	0.02		0.01
SWB1	22-Aug-89	AMERICIUM-241	0.05	PCI/L	0.02		0.01
Maximum			**0.08**				
Minimum			**-0.01**				
Mean			**0.040**				
SWB2	15-Aug-86	AMERICIUM-241	0.15	PCI/L	0.08		
SWB2	3-Jul-89	AMERICIUM-241	0.01	PCI/L	0.01		
SWB2	3-Jul-89	AMERICIUM-241	0.07	PCI/L	0.02		
SWB2	3-Jul-89	AMERICIUM-241	0.04	PCI/L	0.02		
SWB2	5-Jul-89	AMERICIUM-241	0.01	PCI/L	0.01		
SWB2	5-Jul-89	AMERICIUM-241	0.01	PCI/L	0.01		
SWB2	5-Jul-89	AMERICIUM-241	0.03	PCI/L	0.01		
SWB2	5-Jul-89	AMERICIUM-241	0.02	PCI/L	0.01		
SWB2	5-Jul-89	AMERICIUM-241	0.02	PCI/L	0.01		
SWB2	17-Aug-89	AMERICIUM-241	0.05	PCI/L	0.02		0.01
SWB2	17-Aug-89	AMERICIUM-241	0	PCI/L	0.02		0.01
SWB2	17-Aug-89	AMERICIUM-241	0.23	PCI/L	0.03		0.01
Maximum			**0.23**				
Minimum			**0**				
Mean			**0.053**				
SWB3	15-Aug-86	AMERICIUM-241	-0.01	PCI/L	0.04		
SWB3	6-Jul-89	AMERICIUM-241	0.04	PCI/L	0.02		
SWB3	6-Jul-89	AMERICIUM-241	0.03	PCI/L	0.02		
SWB3	6-Jul-89	AMERICIUM-241	0.05	PCI/L	0.01		
SWB3	7-Jul-89	AMERICIUM-241	0.04	PCI/L	0.01		
SWB3	16-Aug-89	AMERICIUM-241	0.04	PCI/L	0.01		0.01
SWB3	16-Aug-89	AMERICIUM-241	0.02	PCI/L	0.01		0.01
SWB3	16-Aug-89	AMERICIUM-241	0.02	PCI/L	0.01		0.01
Maximum			**0.05**				
Minimum			**-0.01**				
Mean			**0.029**				
SWB4	15-Aug-86	AMERICIUM-241	-0.02	PCI/L	0.04		
SWB4	29-Jun-89	AMERICIUM-241	0.02	PCI/L	0.01		
SWB4	29-Jun-89	AMERICIUM-241	0.02	PCI/L	0.01		
SWB4	30-Jun-89	AMERICIUM-241	0.01	PCI/L	0.01		
SWB4	30-Jun-89	AMERICIUM-241	0.02	PCI/L	0.01		
SWB4	15-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWB4	15-Aug-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
SWB4	15-Aug-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
Maximum			**0.02**				
Minimum			**-0.02**				
Mean			**0.0088**				

MEASURED AMERICIUM-241 CONCENTRATION ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SWB5	18-Aug-86	AMERICIUM-241	-0.02	PCI/L	0.04		
SWB5	22-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	23-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	26-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	26-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	26-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	26-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	26-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	26-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	27-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	27-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	27-Jun-89	AMERICIUM-241	-0.01	PCI/L	0.02		
SWB5	28-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	28-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	28-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	28-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	31-Jul-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWB5	10-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWB5	10-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWB5	10-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWB5	10-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWB5	11-Aug-89	AMERICIUM-241	0	PCI/L	0.02		
SWB5	11-Aug-89	AMERICIUM-241	0.01	PCI/L	0.02		
SWB5	14-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWB5	14-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWB5	14-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWB5	21-Mar-90	AMERICIUM-241	0.023	PCI/L	0.009		0.004
SWB5	23-Mar-90	AMERICIUM-241	0.034	PCI/L	0.013		0
Maximum			**0.034**				
Minimum			**-0.02**				
Mean			**0.0013**				

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MEASURED PU-239/240 CONCENTRATION ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SW023	19-Aug-86	Pu-239/240	0.03	PCI/L	0.05		
SW023	16-Oct-90	Pu-239/240	0.004	PCI/L	0.0058173		0.009
SW023	16-Nov-90	Pu-239/240	0.77	PCI/L	0.27		0.144
SW023	4-Dec-90	Pu-239/240	1	PCI/L	U		0.01
SW023	4-Dec-90	Pu-239/240	0	PCI/L	0	U	1
SW023	4-Dec-90	Pu-239/240	0.3	PCI/L	U		0.01
SW023	4-Dec-90	Pu-239/240	0	PCI/L	0	U	0.25
SW023	14-Jan-91	Pu-239/240	0.04	PCI/L	0.021	U	0.021
SW023	28-Mar-91	Pu-239/240	0.005	PCI/L	0.008	U	0.011
SW023	28-Mar-91	Pu-239/240	0.005	PCI/L	0.008	U	0.011
SW023	17-Apr-91	Pu-239/240	0.01	PCI/L	U		0.01
SW023	17-Apr-91	Pu-239/240	0	PCI/L	0.0071		0.013
SW023	17-Apr-91	Pu-239/240	0.0006	PCI/L	0.0058		0.01
SW023	17-Apr-91	Pu-239/240	0.01	PCI/L	U		0.01
SW023	20-May-91	Pu-239/240	0.01069	PCI/L	0.00656		0.004
SW023	25-Jun-91	Pu-239/240	0.003866	PCI/L	0.00494	J	0
SW023	17-Jul-91	Pu-239/240	0.00367	PCI/L	0.00427	J	0.005
SW023	6-Aug-91	Pu-239/240	0.003278	PCI/L	0.00521	J	0.01
SW023	16-Sep-91	Pu-239/240	0.004	PCI/L	0.004	U	0.005
SW023	16-Sep-91	Pu-239/240	0.005	PCI/L	0.004	J	0.004
SW023	16-Sep-91	Pu-239/240	0.001	PCI/L	0.002	J	0.001
SW023	15-Oct-91	Pu-239/240	0.035	PCI/L	0.012		0.001
SW023	20-Jan-92	Pu-239/240	0.002	PCI/L	0.004	U	0.003
SW023	23-Apr-92	Pu-239/240	0.003	PCI/L	0.015	J	0.01
Maximum			**7.00**				
Minimum			**0.00**				
Mean			**0.32**				
SW024	19-Aug-86	Pu-239/240	-0.02	PCI/L	0.09		
Maximum			**-0.02**				
Minimum			**-0.02**				
Mean			**-0.02**				
SW061	22-Jul-87	Pu-239/240	0	PCI/L	0.82		
SW061	1-Jul-88	Pu-239/240	0.0654	PCI/L	0.0795		0.07
SW061	1-Jul-88	Pu-239/240	0.108	PCI/L	0.133		0.1
SW061	20-Mar-89	Pu-239/240	0.04	PCI/L	0.02		
SW061	20-Mar-89	Pu-239/240	0.01	PCI/L	0.01		
SW061	15-May-89	Pu-239/240	0.01	PCI/L	0.01		
SW061	9-Jun-89	Pu-239/240	0.05	PCI/L	0.01		
SW061	6-Jul-89	Pu-239/240	0.02	PCI/L	0.01		
SW061	3-Aug-89	Pu-239/240	0.01	PCI/L	0.01		0.01
SW061	11-Sep-89	Pu-239/240	0.008	PCI/L	0.007		0.007
SW061	3-Oct-89	Pu-239/240	0.016	PCI/L	0.01		0.009
SW061	6-Nov-89	Pu-239/240	0.007	PCI/L	0.005		0
SW061	6-Dec-89	Pu-239/240	0.006	PCI/L	0.004		0
SW061	23-Jan-90	Pu-239/240	0.017	PCI/L	0.009		0
SW061	12-Mar-90	Pu-239/240	0.017	PCI/L	0.007		0.003

MEASURED PU-239/240 CONCENTRATION ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SW061	18-Jun-90	Pu-239/240	0.007	PCI/L	0.006		0.005
SW061	23-Jul-90	Pu-239/240	0.003742	PCI/L	0.00297	J	0.01
SW061	19-Sep-90	Pu-239/240	0.001906	PCI/L	0.0037358		0.006
SW061	17-Oct-90	Pu-239/240	0.008	PCI/L	0.0072834		0.01
SW061	26-Nov-90	Pu-239/240	0.136	PCI/L	0.279	U	0
SW061	7-Dec-90	Pu-239/240	2	PCI/L		U	0.01
SW061	27-Mar-91	Pu-239/240	0.0098	PCI/L	0.0077		0
SW061	11-Apr-91	Pu-239/240	0.063	PCI/L	0.02		0.011
SW061	8-May-91	Pu-239/240	0.005	PCI/L	0.007	U	0
SW061	20-Jun-91	Pu-239/240	0.01503	PCI/L	0.00884		0.006
SW061	12-Jul-91	Pu-239/240	0.005259	PCI/L	0.00559	J	0.005
SW061	7-Aug-91	Pu-239/240	0.0005505	PCI/L	0.00234	J	0.005
SW061	17-Sep-91	Pu-239/240	0.007	PCI/L	0.004	J	0.003
SW061	17-Oct-91	Pu-239/240	0.007	PCI/L	0.004	J	0.001
SW061	17-Oct-91	Pu-239/240	0.006	PCI/L	0.004	J	0.004
SW061	17-Oct-91	Pu-239/240	0.002	PCI/L	0.002	J	0.001
SW061	27-Jan-92	Pu-239/240	0.028	PCI/L	0.01		0.005
SW061	2-Jul-92	Pu-239/240	0.007	PCI/L	0.007	U	0.01
SW061	15-Jul-92	Pu-239/240	0.003	PCI/L	0.004	U	0.006
SW061	29-Jul-92	Pu-239/240	0.008	PCI/L	0.006	U	0.014
SW061	12-Aug-92	Pu-239/240	0.003368	PCI/L	0.00675	J	0.008
SW061	20-Aug-92	Pu-239/240	0.03293	PCI/L	0.0237		0
SW061	8-Sep-92	Pu-239/240	0.003	PCI/L	0.007	U	0.01
SW061	22-Sep-92	Pu-239/240	0.019	PCI/L	0.019	U	0.03
SW061	7-Oct-92	Pu-239/240	0.029	PCI/L	0.014		0.02
SW061	21-Oct-92	Pu-239/240	0.02378	PCI/L	0.0145		0.008
SW061	6-Nov-92	Pu-239/240	0.02016	PCI/L	0.0182		0.02
SW061	17-Nov-92	Pu-239/240	0.02	PCI/L	0.01161		0.01254
SW061	3-Dec-92	Pu-239/240	0.00574	PCI/L	0.00708	J	0
SW061	3-Dec-92	Pu-239/240	0.008608	PCI/L	0.00743	J	0.006
SW061	6-Jan-93	Pu-239/240	0.006195	PCI/L	0.00623	J	0
SW061	13-Jan-93	Pu-239/240	0.016	PCI/L	0.00978		0.00405
SW061	27-Jan-93	Pu-239/240	0.033	PCI/L	0.01081		0.00737
SW061	9-Feb-93	Pu-239/240	0.041	PCI/L	0.00891		0.00127
SW061	24-Feb-93	Pu-239/240	0.028	PCI/L	0.00823		0.00426
SW061	12-Mar-93	Pu-239/240	0.2291	PCI/L	0.0393		0.003
SW061	23-Mar-93	Pu-239/240	0.004291	PCI/L	0.00542	J	0.008
SW061	7-Apr-93	Pu-239/240	-0.002	PCI/L	0.003	U	0.007
SW061	22-Apr-93	Pu-239/240	0.1678	PCI/L	0.042		0.0056748
SW061	5-May-93	Pu-239/240	0.03708	PCI/L	0.0166		0.0103358
SW061	19-May-93	Pu-239/240	0.016	PCI/L	0.008		0.005
SW061	2-Jun-93	Pu-239/240	0.01	PCI/L	0.005		0.00167
SW061	16-Jun-93	Pu-239/240	0.009	PCI/L	0.011	U	0.01
SW061	30-Jun-93	Pu-239/240	0.005	PCI/L	0.007	U	0.008
SW061	14-Jul-93	Pu-239/240	0.012	PCI/L	0.007		0.009
SW061	28-Jul-93	Pu-239/240	0.005	PCI/L	0.004	U	0.007
SW061	11-Aug-93	Pu-239/240	0.009	PCI/L	0.006	J	0.007
SW061	27-Aug-93	Pu-239/240	0.015	PCI/L	0.009		0.009
SW061	8-Sep-93	Pu-239/240	0.018	PCI/L	0.012	U	0.02

MEASURED PU-239/240 CONCENTRATION ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SW061	21-Sep-93	Pu-239/240	0.004	PCI/L	0.007	U	0.01
SW061	28-Sep-93	Pu-239/240	0.009	PCI/L	0.005	J	0.007
SW061	5-Oct-93	Pu-239/240	0.006	PCI/L	0.008	U	0.01
SW061	13-Oct-93	Pu-239/240	0.004	PCI/L	0.005	U	0.008
SW061	19-Oct-93	Pu-239/240	0.021	PCI/L	0.01		0.01
SW061	28-Oct-93	Pu-239/240	0.013	PCI/L	0.009		0.008
SW061	4-Nov-93	Pu-239/240	0.009	PCI/L	0.008	U	0.01
SW061	9-Nov-93	Pu-239/240	0.002	PCI/L	0.004	U	0.02
SW061	18-Nov-93	Pu-239/240	0.009	PCI/L	0.008	U	0.01
SW061	26-Nov-93	Pu-239/240	0.003	PCI/L	0.005	U	0.007
SW061	30-Nov-93	Pu-239/240	0.001	PCI/L	0.004	U	0.008
SW061	9-Dec-93	Pu-239/240	0.012	PCI/L	0.009		0.009
SW061	16-Dec-93	Pu-239/240	0.009	PCI/L	0.008	U	0.01
SW061	23-Dec-93	Pu-239/240	0.007	PCI/L	0.005	J	0.004
SW061	27-Dec-93	Pu-239/240	0.009	PCI/L	0.004	J	0.004
SW061	6-Jan-94	Pu-239/240	0.007	PCI/L	0.004	J	0.006
SW061	13-Jan-94	Pu-239/240	0.015	PCI/L	0.006		0.005
SW061	20-Jan-94	Pu-239/240	0.025	PCI/L	0.008		0.004
SW061	27-Jan-94	Pu-239/240	0.014	PCI/L	0.005		0.004
SW061	4-Feb-94	Pu-239/240	0.009	PCI/L	0.006	J	0.006
SW061	10-Feb-94	Pu-239/240	0.01	PCI/L	0.005		0.005
SW061	15-Feb-94	Pu-239/240	0.001	PCI/L	0.004	U	0.009
SW061	24-Feb-94	Pu-239/240	0.01	PCI/L	0.006		0.005
SW061	3-Mar-94	Pu-239/240	0.002	PCI/L	0.003	U	0.005
SW061	10-Mar-94	Pu-239/240	0.006	PCI/L	0.005	U	0.007
SW061	17-Mar-94	Pu-239/240	0.009	PCI/L	0.006	J	0.007
SW061	22-Mar-94	Pu-239/240	0.011	PCI/L	0.006		0.005
SW061	31-Mar-94	Pu-239/240	0.008	PCI/L	0.005	J	0.007
SW061	7-Apr-94	Pu-239/240	0.008	PCI/L	0.005	J	0.006
Maximum			**2.00**				
Minimum			**0.00**				
Mean			**0.049**				
SWB1	16-Aug-86	Pu-239/240	**4.2**	PCI/L	0.6		
SWB1	7-Jul-89	Pu-239/240	0.03	PCI/L	0.02		
SWB1	10-Jul-89	Pu-239/240	0.15	PCI/L	0.02		
SWB1	10-Jul-89	Pu-239/240	0.08	PCI/L	0.02		
SWB1	10-Jul-89	Pu-239/240	0.85	PCI/L	0.05		
SWB1	10-Jul-89	Pu-239/240	0.06	PCI/L	0.02		
SWB1	21-Aug-89	Pu-239/240	0.06	PCI/L	0.02		0
SWB1	21-Aug-89	Pu-239/240	0.09	PCI/L	0.02		0
SWB1	22-Aug-89	Pu-239/240	0.13	PCI/L	0.02		0
Maximum			**4.20**				
Minimum			**0.03**				
Mean			**0.63**				
SWB2	15-Aug-86	Pu-239/240	0.37	PCI/L	0.19		
SWB2	3-Jul-89	Pu-239/240	0.02	PCI/L	0.01		
SWB2	3-Jul-89	Pu-239/240	0.19	PCI/L	0.03		

MEASURED PU-239/240 CONCENTRATION ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SWB2	3-Jul-89	Pu-239/240	0.16	PCI/L	0.02		
SWB2	5-Jul-89	Pu-239/240	0.02	PCI/L	0.02		
SWB2	5-Jul-89	Pu-239/240	0.02	PCI/L	0.01		
SWB2	5-Jul-89	Pu-239/240	0.11	PCI/L	0.02		
SWB2	5-Jul-89	Pu-239/240	0.02	PCI/L	0.02		
SWB2	5-Jul-89	Pu-239/240	0.07	PCI/L	0.02		
SWB2	17-Aug-89	Pu-239/240	0.02	PCI/L	0.01		0.01
SWB2	17-Aug-89	Pu-239/240	0.04	PCI/L	0.02		0.01
SWB2	17-Aug-89	Pu-239/240	0.5	PCI/L	0.04		0.01
Maximum			**0.50**				
Minimum			**0.02**				
Mean			**0.13**				
SWB3	15-Aug-86	Pu-239/240	0.08	PCI/L	0.08		
SWB3	6-Jul-89	Pu-239/240	0.09	PCI/L	0.02		
SWB3	6-Jul-89	Pu-239/240	0.11	PCI/L	0.03		
SWB3	6-Jul-89	Pu-239/240	0.15	PCI/L	0.03		
SWB3	7-Jul-89	Pu-239/240	0.09	PCI/L	0.02		
SWB3	16-Aug-89	Pu-239/240	0.07	PCI/L	0.02		0.01
SWB3	16-Aug-89	Pu-239/240	0.05	PCI/L	0.02		0.01
SWB3	16-Aug-89	Pu-239/240	0.04	PCI/L	0.01		0.01
Maximum			**0.15**				
Minimum			**0.04**				
Mean			**0.085**				
SWB4	15-Aug-86	Pu-239/240	0.01	PCI/L	0.04		
SWB4	29-Jun-89	Pu-239/240	0.01	PCI/L	0.01		
SWB4	30-Jun-89	Pu-239/240	0.01	PCI/L	0.01		
SWB4	30-Jun-89	Pu-239/240	0.01	PCI/L	0.01		
SWB4	15-Aug-89	Pu-239/240	0.01	PCI/L	0.01		0.01
SWB4	15-Aug-89	Pu-239/240	0	PCI/L	0.01		0.01
SWB4	15-Aug-89	Pu-239/240	0	PCI/L	0.01		0.01
Maximum			**0.01**				
Minimum			**0.00**				
Mean			**0.0071**				
SWB5	18-Aug-86	Pu-239/240	0	PCI/L	0.04		
SWB5	22-Jun-89	Pu-239/240	0	PCI/L	0.14		
SWB5	23-Jun-89	Pu-239/240	0	PCI/L	0.14		
SWB5	26-Jun-89	Pu-239/240	0	PCI/L	0.01		
SWB5	26-Jun-89	Pu-239/240	0	PCI/L	0.01		
SWB5	26-Jun-89	Pu-239/240	0	PCI/L	0.01		
SWB5	26-Jun-89	Pu-239/240	0	PCI/L	0.01		
SWB5	26-Jun-89	Pu-239/240	0.01	PCI/L	0.01		
SWB5	27-Jun-89	Pu-239/240	0	PCI/L	0.01		
SWB5	27-Jun-89	Pu-239/240	0	PCI/L	0.01		
SWB5	27-Jun-89	Pu-239/240	0	PCI/L	0.02		
SWB5	28-Jun-89	Pu-239/240	0	PCI/L	0.01		
SWB5	28-Jun-89	Pu-239/240	0.01	PCI/L	0.01		

MEASURED PU-239/240 CONCENTRATION ALONG S. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SWB5	28-Jun-89	Pu-239/240	0	PCI/L	0.01		
SWB5	28-Jun-89	Pu-239/240	0	PCI/L	0.01		
SWB5	31-Jul-89	Pu-239/240	0.01	PCI/L	0.01		0.01
SWB5	10-Aug-89	Pu-239/240	0	PCI/L	0.01		0.01
SWB5	10-Aug-89	Pu-239/240	0.01	PCI/L	0.01		0.01
SWB5	10-Aug-89	Pu-239/240	0	PCI/L	0.01		0.01
SWB5	10-Aug-89	Pu-239/240	0	PCI/L	0.01		0.01
SWB5	11-Aug-89	Pu-239/240	0	PCI/L	0.01		
SWB5	11-Aug-89	Pu-239/240	0	PCI/L	0.01		
SWB5	14-Aug-89	Pu-239/240	0	PCI/L	0.01		0
SWB5	14-Aug-89	Pu-239/240	0	PCI/L	0.01		0
SWB5	14-Aug-89	Pu-239/240	0	PCI/L	0.01		0
SWB5	21-Mar-90	Pu-239/240	0.002	PCI/L	0.003		
SWB5	23-Mar-90	Pu-239/240	0.016	PCI/L	0.007		
Maximum			**0.016**				
Minimum			**0.000**				
Mean			**0.0021**				

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MEASURED AMERICIUM-241 CONCENTRATION ALONG N. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SW003	20-Aug-86	AMERICIUM-241	0.02	PCI/L	0.03		
SW003	26-Jun-89	AMERICIUM-241	0	PCI/L	0.02		
SW003	18-Aug-89	AMERICIUM-241	0.01	PCI/L	0.02		0.01
SW003	7-Sep-89	AMERICIUM-241	0.004	PCI/L	0.02		0.03
SW003	7-Sep-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SW003	3-Oct-89	AMERICIUM-241	0.003	PCI/L	0.006		0
SW003	3-Nov-89	AMERICIUM-241	0.008	PCI/L	0.006		0
SW003	3-Nov-89	AMERICIUM-241	0.007	PCI/L	0.007		0.006
SW003	3-Nov-89	AMERICIUM-241	0.007	PCI/L	0.007		0.006
SW003	12-Jan-90	AMERICIUM-241	0.016	PCI/L	0.016		0
SW003	12-Feb-90	AMERICIUM-241	0.007	PCI/L	0.005		0.005
SW003	17-Mar-90	AMERICIUM-241	0.005	PCI/L	0.009		0.01
SW003	26-Apr-90	AMERICIUM-241	0.003	PCI/L	0.004		0.01
SW003	24-May-90	AMERICIUM-241	0.017	PCI/L	0.012		0
SW003	22-Jun-90	AMERICIUM-241	0.011	PCI/L	0.008		0.008
SW003	28-Aug-90	AMERICIUM-241	0.002757	PCI/L	0.0054057		0.006
SW003	28-Aug-90	AMERICIUM-241	0.002757	PCI/L	0.0054057		0.006
SW003	28-Aug-90	AMERICIUM-241	0.009832	PCI/L	0.009655		0.011
SW003	28-Aug-90	AMERICIUM-241	0.009832	PCI/L	0.009655		0.011
SW003	24-Sep-90	AMERICIUM-241	0.008	PCI/L	0.011072		0.012
SW003	24-Sep-90	AMERICIUM-241	0	PCI/L	0.0069756		0.012
SW003	24-Sep-90	AMERICIUM-241	0	PCI/L	0.0069756		0.012
SW003	17-Oct-90	AMERICIUM-241	0.012	PCI/L	0.0075048		0.009
SW003	31-Oct-90	AMERICIUM-241	0.009817	PCI/L	0.01284		0.013
SW003	31-Oct-90	AMERICIUM-241	-0.002905	PCI/L	0.0056958		0.011
SW003	15-Nov-90	AMERICIUM-241	0	PCI/L	0.0045864		0.007
SW003	15-Nov-90	AMERICIUM-241	0.002934	PCI/L	0.0057526		0.006
SW003	5-Dec-90	AMERICIUM-241	0.04864	PCI/L	0.0186749		0.015
SW003	5-Dec-90	AMERICIUM-241	0.002999	PCI/L	0.0097961		0.013
SW003	25-Feb-91	AMERICIUM-241	0.008068	PCI/L	0.0105507		0.013
SW003	25-Feb-91	AMERICIUM-241	0	PCI/L	0.0071128		0.011
SW003	19-Mar-91	AMERICIUM-241	0.008	PCI/L	0.008969		0.008
SW003	19-Mar-91	AMERICIUM-241	0.007682	PCI/L	0.0066993		0.004
SW003	17-Apr-91	AMERICIUM-241	0.005566	PCI/L	0.0087318		0.008
SW003	17-Apr-91	AMERICIUM-241	0.00642	PCI/L	0.0089925		0.008
SW003	21-May-91	AMERICIUM-241	0	PCI/L	0.005978		0.011
SW003	21-May-91	AMERICIUM-241	0.005	PCI/L	0.0041101		0.012
SW003	19-Jun-91	AMERICIUM-241	0.001	PCI/L	0.003	U	0.003
SW003	19-Jun-91	AMERICIUM-241	0.002	PCI/L	0.005	U	0.007
SW003	22-Jul-91	AMERICIUM-241	0.002	PCI/L	0.003		0.004
SW003	22-Jul-91	AMERICIUM-241	0.003	PCI/L	0.003		0.003
SW003	21-Aug-91	AMERICIUM-241	0	PCI/L	0.004	U	0.006
SW003	21-Aug-91	AMERICIUM-241	0.005	PCI/L	0.004	BJ	0.005
SW003	3-Jan-00	AMERICIUM-241	0.005	PCI/L	0.006	BJ	0.005
SW003	16-Sep-91	AMERICIUM-241	0.003	PCI/L	0.004	BJ	0.002
SW003	7-Jan-92	AMERICIUM-241	-0.001	PCI/L	0.008	U	0.01
SW003	6-Feb-92	AMERICIUM-241	0.006	PCI/L	0.006	J	0.002
Maximum			**0.0486**				
Minimum			**-0.002905**				
Mean			**0.0062**				
SW016	26-Jun-89	AMERICIUM-241	0	PCI/L	0.02		

MEASURED AMERICIUM-241 CONCENTRATION ALONG N. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SW016	17-Jul-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SW016	10-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SW016	25-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SW016	3-Oct-89	AMERICIUM-241	0.026	PCI/L	0.019		0
SW016	17-Mar-90	AMERICIUM-241	0.005	PCI/L	0.007		0.01
SW016	24-May-90	AMERICIUM-241	0.005	PCI/L	0.004		0.004
SW016	26-Jun-90	AMERICIUM-241	0.007	PCI/L	0.006		0.004
SW016	24-Jul-90	AMERICIUM-241	1.204	PCI/L	0.158		0.01
SW016	23-Aug-90	AMERICIUM-241	0	PCI/L	0.0029812		0.004
SW016	24-Sep-90	AMERICIUM-241	0.01	PCI/L	0.009457		0.013
Maximum			**1.204**				
Minimum			**0.000**				
Mean			**0.097**				
SW017	12-Aug-86	AMERICIUM-241	0	PCI/L	0.02		
SW017	25-Oct-90	AMERICIUM-241	0.02	PCI/L	U		0.01
SW017	25-Oct-90	AMERICIUM-241	0	PCI/L	0.001	U	0.016
SW017	28-Nov-90	AMERICIUM-241	0.008	PCI/L	U		0.01
SW017	12-Dec-90	AMERICIUM-241	0.855	PCI/L	1.005	U	0
SW017	14-Mar-91	AMERICIUM-241	0	PCI/L	0.007	U	0.017
SW017	11-Apr-91	AMERICIUM-241	0.005	PCI/L	0.022	U	0.01
SW017	22-May-91	AMERICIUM-241	0.004814	PCI/L	0.00487	J	0.005
SW017	26-Jun-91	AMERICIUM-241	0.005562	PCI/L	0.0079	J	0
SW017	29-Jul-91	AMERICIUM-241	0.005206	PCI/L	0.00604	J	0.01
SW017	14-Aug-91	AMERICIUM-241	0.005271	PCI/L	0.00475	J	0
SW017	19-Sep-91	AMERICIUM-241	0.006	PCI/L	0.004	J	0.001
SW017	19-Sep-91	AMERICIUM-241	0.012	PCI/L	0.012		0.004
SW017	19-Sep-91	AMERICIUM-241	0.006	PCI/L	0.006	J	0.004
SW017	28-Oct-91	AMERICIUM-241	0.001	PCI/L	0.004	U	0.004
SW017	26-Feb-92	AMERICIUM-241	0	PCI/L	0	U	0.01
Maximum			**0.855**				
Minimum			**0.000**				
Mean			**0.0555**				
SW092	23-Mar-89	AMERICIUM-241	0.02	PCI/L	0.01		
SW092	23-Mar-89	AMERICIUM-241	0.01	PCI/L	0.02		
SW092	15-May-89	AMERICIUM-241	0.01	PCI/L	0.02		
SW092	9-Jun-89	AMERICIUM-241	0	PCI/L	0.01		
SW092	6-Jul-89	AMERICIUM-241	0	PCI/L	0.01		
SW092	3-Aug-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
SW092	7-Sep-89	AMERICIUM-241	0.016	PCI/L	0.01		0
SW092	11-Oct-89	AMERICIUM-241	0.047	PCI/L	0.013		0
SW092	6-Dec-89	AMERICIUM-241	-0.001	PCI/L	0.003		0.004
SW092	26-Jan-90	AMERICIUM-241	0.013	PCI/L	0.007		0.005
SW092	26-Jan-90	AMERICIUM-241	0.013	PCI/L	0.007		0.005
SW092	14-Feb-90	AMERICIUM-241	0.018	PCI/L	0.008		0.007
SW092	14-Feb-90	AMERICIUM-241	0.018	PCI/L	0.008		0.007
SW092	24-May-90	AMERICIUM-241	0.009	PCI/L	0.013		0.014
SW092	22-Jun-90	AMERICIUM-241	0.004	PCI/L	0.007		0.009
SW092	25-Jul-90	AMERICIUM-241	0.005902	PCI/L	0.00754	J	0.01
SW092	25-Jul-90	AMERICIUM-241	0.00346	PCI/L	0.00348	J	0.01

MEASURED AMERICIUM-241 CONCENTRATION ALONG N. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SW092	30-Aug-90	AMERICIUM-241	0.01401	PCI/L	0.0125048		0.013
SW092	25-Sep-90	AMERICIUM-241	0.02	PCI/L	0.0103057		0.011
SW092	17-Oct-90	AMERICIUM-241	0.01075	PCI/L	0.0065954		0.007
SW092	12-Dec-90	AMERICIUM-241	0	PCI/L	0.097	U	1.032
SW092	14-Mar-91	AMERICIUM-241	0.004	PCI/L		U	0.01
SW092	15-Apr-91	AMERICIUM-241	0	PCI/L	0.003	U	0.009
SW092	21-May-91	AMERICIUM-241	0.01045	PCI/L	0.00705		0
SW092	26-Jun-91	AMERICIUM-241	0.00114	PCI/L	0.00228	J	0
SW092	9-Jul-91	AMERICIUM-241	0	PCI/L	0.0192	J	0
SW092	15-Aug-91	AMERICIUM-241	0.005525	PCI/L	0.00498	J	0
SW092	25-Sep-91	AMERICIUM-241	0	PCI/L	0.03	U	0.009
SW092	29-Oct-91	AMERICIUM-241	0.002	PCI/L	0.003	U	0.003
SW092	6-Feb-92	AMERICIUM-241	0.008	PCI/L	0.006	J	0.002
SW092	6-Feb-92	AMERICIUM-241	0.006	PCI/L	0.008	J	0.004
SW092	6-Feb-92	AMERICIUM-241	0.003	PCI/L	0.006	U	0.009
Maximum			**0.047**				
Minimum			**-0.001**				
Mean			**0.0088**				
SW113	25-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SW113	18-Oct-89	AMERICIUM-241	0.006	PCI/L	0.016		0.021
Maximum			**0.006**				
Minimum			**0**				
Mean			**0.0030**				
SW118	29-Oct-90	AMERICIUM-241	0.01	PCI/L		U	0.01
SW118	29-Oct-90	AMERICIUM-241	0.013	PCI/L	0.001	U	0.013
SW118	27-Nov-90	AMERICIUM-241	0.01	PCI/L		U	0.01
SW118	13-Dec-90	AMERICIUM-241	0.005	PCI/L	0.006	U	0.006
SW118	21-Mar-91	AMERICIUM-241	0.07	PCI/L		U	0.01
SW118	10-Apr-91	AMERICIUM-241	0.081	PCI/L	0.25	U	0.461
SW118	9-May-91	AMERICIUM-241	1.087	PCI/L	0.807	U	0.92
SW118	9-May-91	AMERICIUM-241	2.7	PCI/L	2.3		
SW118	26-Jun-91	AMERICIUM-241	0.008126	PCI/L	0.00581	J	0
SW118	29-Jul-91	AMERICIUM-241	0.001465	PCI/L	0.00293	J	0
SW118	7-Aug-91	AMERICIUM-241	0.002946	PCI/L	0.00418	J	0.01
SW118	12-Mar-92	AMERICIUM-241	0.006	PCI/L	-1.4797		0.015
Maximum			**2.7**				
Minimum			**0.001465**				
Mean			**0.333**				
SWA1	14-Aug-86	AMERICIUM-241	0.02	PCI/L	0.03		
SWA1	14-Jul-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
SWA1	14-Jul-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
SWA1	14-Jul-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
SWA1	24-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA1	24-Aug-89	AMERICIUM-241	0	PCI/L	0.02		0.01
SWA1	24-Aug-89	AMERICIUM-241	0.02	PCI/L	0.01		0.01
Maximum			**0.02**				

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
Minimum			**0**				
Mean			**0.010**				
SWA2	14-Aug-86	AMERICIUM-241	0.05	PCI/L	0.04		
SWA2	12-Jul-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA2	13-Jul-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA2	13-Jul-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA2	13-Jul-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
SWA2	23-Aug-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
SWA2	23-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA2	23-Aug-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
Maximum			**0.05**				
Minimum			**0**				
Mean			**0.010**				
SWA3	14-Aug-86	AMERICIUM-241	0.01	PCI/L	0.02		
SWA3	12-Jul-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
SWA3	12-Jul-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
SWA3	12-Jul-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
SWA3	12-Jul-89	AMERICIUM-241	0.02	PCI/L	0.01		0.01
SWA3	12-Jul-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
SWA3	23-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA3	23-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA3	23-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA3	23-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA3	23-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA3	23-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
Maximum			**0.02**				
Minimum			**0**				
Mean			**0.0058**				
SWA4	14-Aug-86	AMERICIUM-241	0.05	PCI/L	0.04		
SWA4	10-Jul-89	AMERICIUM-241	0	PCI/L	0.01		
SWA4	11-Jul-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA4	11-Jul-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA4	11-Jul-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA4	11-Jul-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA4	11-Jul-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA4	31-Jul-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA4	1-Aug-89	AMERICIUM-241	0.01	PCI/L	0.01		0.01
SWA4	1-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA4	22-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA4	22-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA4	22-Aug-89	AMERICIUM-241	0	PCI/L	0.01		0.01
SWA4	23-Mar-90	AMERICIUM-241	0.028	PCI/L	0.013		0
SWA4	24-Mar-90	AMERICIUM-241	0.102	PCI/L	0.016		0
SWA4	1-May-90	AMERICIUM-241	-0.002986	PCI/L	0.005855		0.012
Maximum			**0.102**				
Minimum			**-0.002986**				

MEASURED AMERICIUM-241 CONCENTRATION ALONG N. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
Mean			**0.0117**				

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MEASURED PU-239/240 CONCENTRATION ALONG N. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SW003	20-Aug-86	PLUTONIUM-239/240	-0.04	PCI/L	0.17		
SW003	26-Jun-89	PLUTONIUM-239/240	0	PCI/L	0.01		
SW003	18-Aug-89	PLUTONIUM-239/240	0	PCI/L	0.01		0.01
SW003	7-Sep-89	PLUTONIUM-239/240	0.035	PCI/L	0.023		0
SW003	7-Sep-89	PLUTONIUM-239/240	0	PCI/L	0.01		0.01
SW003	3-Oct-89	PLUTONIUM-239/240	0.01	PCI/L	0.008		0.006
SW003	3-Nov-89	PLUTONIUM-239/240	0.012	PCI/L	0.005		0
SW003	3-Nov-89	PLUTONIUM-239/240	0.012	PCI/L	0.005		0
SW003	3-Nov-89	PLUTONIUM-239/240	0.016	PCI/L	0.01		0
SW003	12-Jan-90	PLUTONIUM-239/240	0.003	PCI/L	0.003		0.01
SW003	12-Feb-90	PLUTONIUM-239/240	0.006	PCI/L	0.005		0.004
SW003	17-Mar-90	PLUTONIUM-239/240	0.013	PCI/L	0.006		0.01
SW003	24-May-90	PLUTONIUM-239/240	0.026	PCI/L	0.014		0.007
SW003	22-Jun-90	PLUTONIUM-239/240	0.033	PCI/L	0.012		0
SW003	28-Aug-90	PLUTONIUM-239/240	0.009689	PCI/L	0.0108741		0.013
SW003	28-Aug-90	PLUTONIUM-239/240	0.009689	PCI/L	0.0108741		0.013
SW003	28-Aug-90	PLUTONIUM-239/240	0.009271	PCI/L	0.0060838		0.005
SW003	28-Aug-90	PLUTONIUM-239/240	0.009271	PCI/L	0.0060838		0.005
SW003	24-Sep-90	PLUTONIUM-239/240	0.006	PCI/L	0.0070148		0.01
SW003	24-Sep-90	PLUTONIUM-239/240	0.0033	PCI/L	0.0064719		0.007
SW003	24-Sep-90	PLUTONIUM-239/240	0.0033	PCI/L	0.0064719		0.007
SW003	17-Oct-90	PLUTONIUM-239/240	0	PCI/L	0.0076009		0.014
SW003	31-Oct-90	PLUTONIUM-239/240	0.002351	PCI/L	0.0069129		0.009
SW003	31-Oct-90	PLUTONIUM-239/240	0.003806	PCI/L	0.0074637		0.01
SW003	15-Nov-90	PLUTONIUM-239/240	0.005134	PCI/L	0.0050431		0.006
SW003	15-Nov-90	PLUTONIUM-239/240	0.008365	PCI/L	0.0070482		0.008
SW003	5-Dec-90	PLUTONIUM-239/240	0.003507	PCI/L	0.0091669		0.013
SW003	5-Dec-90	PLUTONIUM-239/240	0.004864	PCI/L	0.0063622		0.008
SW003	25-Feb-91	PLUTONIUM-239/240	-0.000707	PCI/L	0.0041552		0.008
SW003	25-Feb-91	PLUTONIUM-239/240	0.01966	PCI/L	0.0075146		0.004
SW003	19-Mar-91	PLUTONIUM-239/240	0.007052	PCI/L	0.0076871		0.008
SW003	19-Mar-91	PLUTONIUM-239/240	0.002688	PCI/L	0.0087808		0.01
SW003	17-Apr-91	PLUTONIUM-239/240	0.002	PCI/L	0.0019639		0
SW003	17-Apr-91	PLUTONIUM-239/240	0.005714	PCI/L	0.0067306		0.008
SW003	21-May-91	PLUTONIUM-239/240	0.005632	PCI/L	0.0030204		0.002
SW003	21-May-91	PLUTONIUM-239/240	0.006362	PCI/L	0.0053567		0.004
SW003	19-Jun-91	PLUTONIUM-239/240	0.001	PCI/L	0.001	U	0.003
SW003	19-Jun-91	PLUTONIUM-239/240	0.012	PCI/L	0.008		0.008
SW003	21-Aug-91	PLUTONIUM-239/240	0.003	PCI/L	0.003	JX	0.003
SW003	21-Aug-91	PLUTONIUM-239/240	0.008	PCI/L	0.008	U	0.009
SW003	16-Sep-91	PLUTONIUM-239/240	0.009	PCI/L	0.006	J	0.002
SW003	16-Sep-91	PLUTONIUM-239/240	0	PCI/L	0.003	U	0.002
SW003	7-Jan-92	PLUTONIUM-239/240	0.002	PCI/L	0.003	U	0.005
SW003	6-Feb-92	PLUTONIUM-239/240	0.003	PCI/L	0.006	U	0.008
Maximum			**0.035**				
Minimum			**-0.04**				
Mean			**0.0067**				
SW016	26-Jun-89	PLUTONIUM-239/240	0	PCI/L	0.01	193792	
SW016	26-Jun-89	PLUTONIUM-239/240	0.01	PCI/L	0.02		
SW016	17-Jul-89	PLUTONIUM-239/240	0	PCI/L	0.01		0.01
SW016	10-Aug-89	PLUTONIUM-239/240	0.01	PCI/L	0.01		0.01

MEASURED PU-239/240 CONCENTRATION ALONG N. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SW016	25-Aug-89	PLUTONIUM-239/240	0	PCI/L	0.01		0
SW016	6-Sep-89	PLUTONIUM-239/240	0.005	PCI/L	0.005		0.006
SW016	3-Oct-89	PLUTONIUM-239/240	0.019	PCI/L	0.008		0
SW016	17-Oct-89	PLUTONIUM-239/240	0.01	PCI/L	0.006		0
SW016	17-Mar-90	PLUTONIUM-239/240	0.014	PCI/L	0.007		0.01
SW016	24-May-90	PLUTONIUM-239/240	0.005	PCI/L	0.007		0.007
SW016	26-Jun-90	PLUTONIUM-239/240	0.003	PCI/L	0.006		0
SW016	24-Jul-90	PLUTONIUM-239/240	0.004975	PCI/L	0.0058	J	0.01
SW016	23-Aug-90	PLUTONIUM-239/240	0.0008906	PCI/L	0.0034908		0.006
SW016	24-Sep-90	PLUTONIUM-239/240	0.0105	PCI/L	0.0068914		0.005
Maximum			**0.019**				
Minimum			**0**				
Mean			**0.0064**				
SW017	12-Aug-86	PLUTONIUM-239/240	0	PCI/L			0.03
SW017	25-Oct-90	PLUTONIUM-239/240	0.3	PCI/L		U	0.01
SW017	25-Oct-90	PLUTONIUM-239/240	0	PCI/L	0.001	U	0.31
SW017	28-Nov-90	PLUTONIUM-239/240	1	PCI/L		U	0.01
SW017	12-Dec-90	PLUTONIUM-239/240	0.003	PCI/L	0.01	U	0.016
SW017	14-Mar-91	PLUTONIUM-239/240	0.003	PCI/L	0.013	U	0.018
SW017	11-Apr-91	PLUTONIUM-239/240	0.003	PCI/L	0.008	U	0.01
SW017	22-May-91	PLUTONIUM-239/240	0.01862	PCI/L	0.0095		0.00
SW017	26-Jun-91	PLUTONIUM-239/240	-0.00107	PCI/L	0.00215	J	0.00
SW017	29-Jul-91	PLUTONIUM-239/240	-0.00119	PCI/L	0.00138	J	0.01
SW017	14-Aug-91	PLUTONIUM-239/240	0	PCI/L	0.0033	J	0.00
SW017	19-Sep-91	PLUTONIUM-239/240	0.002	PCI/L	0.006	U	0.006
SW017	19-Sep-91	PLUTONIUM-239/240	0.004	PCI/L	0.004	J	0.004
SW017	19-Sep-91	PLUTONIUM-239/240	-0.001	PCI/L	0.002	U	0.004
SW017	28-Oct-91	PLUTONIUM-239/240	0.003	PCI/L	0.003	J	0.003
SW017	26-Feb-92	PLUTONIUM-239/240	0.027	PCI/L	-0.3945		0.01
Maximum			**1.00**				
Minimum			**-0.00119**				
Mean			**0.0807**				
SW092	7-Jul-88	PLUTONIUM-239/240	**0.602**	PCI/L	0.194		0.2
SW092	7-Jul-88	PLUTONIUM-239/240	0	PCI/L	0.0885		0.2
SW092	23-Mar-89	PLUTONIUM-239/240	0.02	PCI/L	0.02		
SW092	23-Mar-89	PLUTONIUM-239/240	0.02	PCI/L	0.02		
SW092	15-May-89	PLUTONIUM-239/240	0.03	PCI/L	0.01		
SW092	9-Jun-89	PLUTONIUM-239/240	0	PCI/L	0.01		
SW092	6-Jul-89	PLUTONIUM-239/240	0	PCI/L	0.01		
SW092	3-Aug-89	PLUTONIUM-239/240	0.02	PCI/L	0.01		0.01
SW092	7-Sep-89	PLUTONIUM-239/240	0.007	PCI/L	0.005		0.003
SW092	11-Oct-89	PLUTONIUM-239/240	0.029	PCI/L	0.011		0
SW092	6-Dec-89	PLUTONIUM-239/240	0.006	PCI/L	0.004		0
SW092	26-Jan-90	PLUTONIUM-239/240	0.014	PCI/L	0.006		0
SW092	26-Jan-90	PLUTONIUM-239/240	0.014	PCI/L	0.006		0
SW092	14-Feb-90	PLUTONIUM-239/240	0.028	PCI/L	0.01		0.004
SW092	14-Feb-90	PLUTONIUM-239/240	0.028	PCI/L	0.01		0.004
SW092	13-Mar-90	PLUTONIUM-239/240	0.106	PCI/L	0.018		0.004
SW092	24-May-90	PLUTONIUM-239/240	0.077	PCI/L	0.012		0.007

MEASURED PU-239/240 CONCENTRATION ALONG N. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SW092	22-Jun-90	PLUTONIUM-239/240	0.017	PCI/L	0.008		0.003
SW092	25-Jul-90	PLUTONIUM-239/240	0.005201	PCI/L	0.00454	J	0.01
SW092	25-Jul-90	PLUTONIUM-239/240	0.01011	PCI/L	0.00498		0.01
SW092	25-Jul-90	PLUTONIUM-239/240	-0.000446	PCI/L	0.00155	J	0.01
SW092	30-Aug-90	PLUTONIUM-239/240	0.00666	PCI/L	0.0049078		0.005
SW092	25-Sep-90	PLUTONIUM-239/240	0.0524	PCI/L	0.0153233		0.007
SW092	17-Oct-90	PLUTONIUM-239/240	0.005281	PCI/L	0.0041532		0.005
SW092	12-Dec-90	PLUTONIUM-239/240	0	PCI/L	0.006	U	0.018
SW092	14-Mar-91	PLUTONIUM-239/240	0.006	PCI/L		U	0.01
SW092	15-Apr-91	PLUTONIUM-239/240	0.004	PCI/L	0.008	U	0.018
SW092	21-May-91	PLUTONIUM-239/240	0.0118	PCI/L	0.00777		0
SW092	26-Jun-91	PLUTONIUM-239/240	0.004195	PCI/L	0.00536	J	0
SW092	9-Jul-91	PLUTONIUM-239/240	0.008666	PCI/L	0.00602	J	0
SW092	15-Aug-91	PLUTONIUM-239/240	0.008457	PCI/L	0.00766	J	0.007
SW092	25-Sep-91	PLUTONIUM-239/240	0.009	PCI/L	0.006	J	0.001
SW092	29-Oct-91	PLUTONIUM-239/240	0.003	PCI/L	0.003	U	0.004
SW092	6-Feb-92	PLUTONIUM-239/240	0.002	PCI/L	0.004	U	0.005
SW092	6-Feb-92	PLUTONIUM-239/240	0.004	PCI/L	0.004	J	0.001
SW092	6-Feb-92	PLUTONIUM-239/240	0	PCI/L	0	U	0.005
Maximum			**0.602**				
Minimum			**-0.000446**				
Mean			**0.0322**				
SW113	25-Aug-89	PLUTONIUM-239/240	0	PCI/L	0.01		0
SW113	18-Oct-89	PLUTONIUM-239/240	0.009	PCI/L	0.007		0
Maximum			**0.009**				
Minimum			**0**				
Mean			**0.0045**				
SW118	29-Oct-90	PLUTONIUM-239/240	0.3	PCI/L		U	0.01
SW118	29-Oct-90	PLUTONIUM-239/240	0	PCI/L	0.001	U	0.29
SW118	27-Nov-90	PLUTONIUM-239/240	0.04	PCI/L		U	0.01
SW118	13-Dec-90	PLUTONIUM-239/240	0	PCI/L	0.035	U	0.099
SW118	21-Mar-91	PLUTONIUM-239/240	0.02	PCI/L	0.01		0.01
SW118	10-Apr-91	PLUTONIUM-239/240	-0.002	PCI/L	0.005	U	0.013
SW118	9-May-91	PLUTONIUM-239/240	0.0007	PCI/L	0.0021		
SW118	9-May-91	PLUTONIUM-239/240	0.001	PCI/L	0.002	U	0
SW118	26-Jun-91	PLUTONIUM-239/240	0.008616	PCI/L	0.00713	J	0.006
SW118	29-Jul-91	PLUTONIUM-239/240	-0.00103	PCI/L	0.00206	J	0.005
SW118	7-Aug-91	PLUTONIUM-239/240	0.003507	PCI/L	0.00406	J	0.01
SW118	12-Mar-92	PLUTONIUM-239/240	0.005	PCI/L	0.01		0.013
Maximum			**0.3**				
Minimum			**-0.002**				
Mean			**0.0313**				
SWA1	14-Aug-86	PLUTONIUM-239/240	0.24	PCI/L	0.14		
SWA1	14-Jul-89	PLUTONIUM-239/240	0.02	PCI/L	0.01		0.01
SWA1	14-Jul-89	PLUTONIUM-239/240	0.01	PCI/L	0.01		0.01
SWA1	14-Jul-89	PLUTONIUM-239/240	0.03	PCI/L	0.01		0.01

MEASURED PU-239/240 CONCENTRATION ALONG N. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SWA1	24-Aug-89	PLUTONIUM-239/240	0.02	PCI/L	0.01		0
SWA1	24-Aug-89	PLUTONIUM-239/240	0.02	PCI/L	0.01		0
SWA1	24-Aug-89	PLUTONIUM-239/240	0.02	PCI/L	0.01		0
Maximum			**0.24**				
Minimum			**0.01**				
Mean			**0.0514**				
SWA2	14-Aug-86	PLUTONIUM-239/240	0.17	PCI/L	0.06		
SWA2	12-Jul-89	PLUTONIUM-239/240	0.02	PCI/L	0.01		0
SWA2	13-Jul-89	PLUTONIUM-239/240	0.02	PCI/L	0.01		0.01
SWA2	13-Jul-89	PLUTONIUM-239/240	0.02	PCI/L	0.01		0.01
SWA2	13-Jul-89	PLUTONIUM-239/240	0.03	PCI/L	0.01		0.01
SWA2	23-Aug-89	PLUTONIUM-239/240	0.02	PCI/L	0.01		0
SWA2	23-Aug-89	PLUTONIUM-239/240	0.02	PCI/L	0.01		0
SWA2	23-Aug-89	PLUTONIUM-239/240	0.03	PCI/L	0.01		0
Maximum			**0.17**				
Minimum			**0.02**				
Mean			**0.0413**				
SWA3	14-Aug-86	PLUTONIUM-239/240	0.03	PCI/L	0.06		
SWA3	12-Jul-89	PLUTONIUM-239/240	0.02	PCI/L	0.01		0
SWA3	12-Jul-89	PLUTONIUM-239/240	0.01	PCI/L	0.01		0
SWA3	12-Jul-89	PLUTONIUM-239/240	0.01	PCI/L	0.01		0
SWA3	12-Jul-89	PLUTONIUM-239/240	0	PCI/L	0.01		0
SWA3	12-Jul-89	PLUTONIUM-239/240	0.02	PCI/L	0.01		0
SWA3	23-Aug-89	PLUTONIUM-239/240	0.01	PCI/L	0.01		0
SWA3	23-Aug-89	PLUTONIUM-239/240	0.01	PCI/L	0.01		0
SWA3	23-Aug-89	PLUTONIUM-239/240	0	PCI/L	0.01		0
SWA3	23-Aug-89	PLUTONIUM-239/240	0.01	PCI/L	0.01		0
SWA3	23-Aug-89	PLUTONIUM-239/240	0.02	PCI/L	0.01		0
SWA3	23-Aug-89	PLUTONIUM-239/240	0.01	PCI/L	0.01		0
Maximum			**0.03**				
Minimum			**0**				
Mean			**0.0125**				
SWA4	14-Aug-86	PLUTONIUM-239/240	0	PCI/L	0.07		
SWA4	10-Jul-89	PLUTONIUM-239/240	0	PCI/L	0.01		
SWA4	11-Jul-89	PLUTONIUM-239/240	0	PCI/L	0.01		0.01
SWA4	11-Jul-89	PLUTONIUM-239/240	0.02	PCI/L	0.01		0.01
SWA4	11-Jul-89	PLUTONIUM-239/240	0	PCI/L	0.01		0.01
SWA4	11-Jul-89	PLUTONIUM-239/240	0.01	PCI/L	0.01		0.01
SWA4	11-Jul-89	PLUTONIUM-239/240	0.01	PCI/L	0.01		0.01
SWA4	31-Jul-89	PLUTONIUM-239/240	0	PCI/L	0.01		0.01
SWA4	1-Aug-89	PLUTONIUM-239/240	0.01	PCI/L	0.01		0.01
SWA4	1-Aug-89	PLUTONIUM-239/240	0	PCI/L	0.01		0.01
SWA4	22-Aug-89	PLUTONIUM-239/240	0	PCI/L	0.01		0
SWA4	22-Aug-89	PLUTONIUM-239/240	0	PCI/L	0.01		0
SWA4	22-Aug-89	PLUTONIUM-239/240	0	PCI/L	0.01		0
SWA4	23-Mar-90	PLUTONIUM-239/240	0.009	PCI/L	0.005		

MEASURED PU-239/240 CONCENTRATION ALONG N. WALNUT CREEK

Location Code	Sample Date	Chemical	Result	Unit	Error	Lab Qual	D.L
SWA4	24-Mar-90	PLUTONIUM-239/240	0.016	PCI/L	0.007		
SWA4	1-May-90	PLUTONIUM-239/240	0.0009464	PCI/L	0.00371		0.004
Maximum			**0.02**				
Minimum			**0**				
Mean			**0.0047**				

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APPENDIX I
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APPENDIX I
OU6 AIR MODELING

Air modeling was conducted to support the Baseline Human Health Risk Assessment for OU6 (Appendix J) by predicting hourly and annual average ambient concentrations of particulate matter (metals and radionuclides) emitted from surface and subsurface soils and VOC concentrations in buildings as a result of potential soil gas transport. This appendix describes the models selected to simulate pollutant dispersion, modeling setup and assumptions, modeling input parameters, and results obtained.

I1 MODEL SELECTION

To meet the objectives of this study, the Ventilated Valley Dispersion Model (VVDM), an air dispersion box model, was used for estimating outdoor concentrations. This model was selected for use in this study based on onsite receptor modeling objectives and selection criteria specified in Appendix I to the Phase I RFI/RI Work Plan for Operable Unit No. 6, Technical Memorandum No. 3, Model Description (DOE 1994b). Box models are typically used in a drainage area scenario where dispersion is physically constrained by surrounding terrain. However, they are also frequently used to provide maximum, worst-case estimates of ambient air concentrations to individuals in the immediate vicinity of an emission source.

A soil gas transport model was used to estimate VOC concentrations in a hypothetical building as a result of volatilization from groundwater contaminants. It was also selected for use in this study based on modeling objectives and selection criteria specified in Technical Memorandum No. 3 (DOE 1994b).

Descriptions of the two models are provided in the following paragraphs.

<u>The Ventilated Valley Dispersion Model</u>

The VVDM is based on conservation of mass principles using a box model equation in which the emission rate for a specific period is divided by the volume of the box. This volume is delineated by the cross-sectional area projected horizontally by the wind speed during the same time interval used for the input emission rate. The cross-sectional area is determined by the width and height of the box. This model assumes complete mixing of pollutants within a series of boxes defined by the surface area(s) (i.e., the length and width of the affected area) and an imaginary lid. For this site, only one box was used for mixing pollutants. The height of the imaginary lid is defined by the assumed mixing height. For purposes of conservative ambient impact estimation, the mixing height is assumed to be a function of turbulence induced by surface roughness and the length of the "box" being considered.

The average pollutant concentrations within the box during any period is equal to the amount of pollutant emitted into the box during that period plus the pollutants in upwind boxes flowing into the box minus the amount of pollutant flowing out of the box.

The basic equation of VVDM is as follows:

$$\frac{dm_i}{dt} = Q_i + \sum_{k=1}^{n}\left[\left(\frac{A_k \times U_k \times m_k}{V_k}\right) - \left(\frac{A_i \times U_i \times m_i}{V_i}\right)\right] \tag{I.1}$$

where:

m_i	=	mass of the pollutant material in the "box" (g)
Q_i	=	emission rate of pollutant material from sources located within the "box" in grams per second (g/sec)
n	=	number of boxes draining into the "box"
A_k	=	cross-sectional area of the drainage box (square meters [m^2])
u_k	=	mean wind speed flowing through the drainage box (meters per second [m/sec])
m_k	=	mass of the pollutant material from sources located within the drainage box (g)
V_k	=	volume of the drainage box (m^3)
A_i	=	cross-sectional area of the box (m^2)

U_i	=	mean wind speed flowing through the box (m/sec)
V_i	=	the volume of the box (m^3)

For this study, no upwind boxes are assumed; therefore, no dilution of ambient concentrations from fresh air entering the box is assumed. This is a highly conservative assumption. "Dilution" occurs only as a result of wind flushing the box.

Exercising this model involves computing the pollutant concentration in the box for a series of sequential time steps. In this case, sequential time steps of 10 seconds are assumed. Concentration estimates are made for as many as 360 model time steps every hour. Inherent to the solution of the model is the assumption that there is instantaneous, uniform mixing of emissions introduced into the box for each time step. That is, the concentration of any pollutant is constant throughout the volume of the box at any given time. Furthermore, the emissions in the box and the meteorological conditions affecting the emissions are assumed constant over each hour.

Soil Gas Transport Model

This model incorporates equations provided in the *Superfund Exposure Assessment Manual* (SEAM) (EPA 1988c) for estimating VOC releases from covered landfills and equations for transport of VOCs into buildings from Little et al. (1992). This is a spreadsheet model that was written by Woodward-Clyde Consultants (WCC).

Contributions to surface volatilization emissions from the underlying UHSU groundwater will be estimated using the following equation, adapted from Thibodeaux and Hwang (1982), as presented in SEAM:

$$E_{i(gw)} = 2DC_sA/(d + ((2DC_st/C_b) + d^2)^{0.5}) \qquad (I.2)$$

where:

$E_{i(gw)}$	=	emission rate of contaminant in groundwater i over time (g/sec)
D	=	phase transfer coefficient (cm^2/sec)
C_s	=	the groundwater concentration of contaminant i (µg/L)

C_b	=	bulk contaminant i concentration in the soil (μg/L)
A	=	contaminated surface area of the site (cm^2)
d	=	depth of the dry zone at sampling time (cm)
t	=	time measured from sampling time (sec)

This equation assumes that the soil pore spaces connect with the soil surface, the soil conditions are isothermal, and that there is no capillary rise of contaminant. In addition, sufficient liquid contaminant in the pore spaces is assumed to exist so that volatilization will not deplete the reservoir of contaminant to the point where the rate of volatilization is affected. Use of this equation simulates vapor diffusion as being soil-phase controlled and assumes that contaminant concentrations in the soil remain constant until all contaminant is volatilized to the ambient air at the surface. Contaminant release is assumed to occur by the "peeling away" of successive unimolecular layers of contaminant from the surface of the "wet" contaminated zone. Thus, over time, a "dry zone" of increasing depth at the soil surface and a wet zone of decreasing depth below the dry zone develops. Concentrations of the contaminant in the soil immediately surrounding the groundwater areas and within the groundwater are used in this estimation method.

The bulk contaminant (C_b) is the sum of the dissolved contaminant mass and the mass of any contaminant associated with the solid phase of the soil. The equation used to calculate bulk soil is adapted from Fetter (1993) and shown below:

$$C_b = K_d\,[(C_s r) + (C_s P_t)] \tag{I.3}$$

where:

C_b	=	bulk contaminant i concentration in soil (μg/L)
K_d	=	soil-water partition coefficient (cm^3/g)
C_s	=	the groundwater concentration of contaminant i (μg/L)
r	=	bulk density (1.84 g/cm^3)
P_t	=	total soil porosity (0.1 dimensionless)

The term, D, in equation (I.4) is related to the amount of contaminant i that transfers from the liquid to gas phases and then from the gas phase to diffusion in the surface air and is estimated by:

$$D = D_i(P_t^{4/3})\, H_i' \tag{I.4}$$

where:

D_i	=	vapor diffusion coefficient in air (cm^2/sec)
P_t	=	total soil porosity (cm^3/cm^3)
H_i'	=	Henry's Law constant in concentration form (dimensionless)

Finally, the term, H_i', is estimated by the below equation:

$$H_i' = H_i / RT \tag{I.5}$$

where:

H_i'	=	Henry's Law constant of the contaminant i (atm-m^3/g-mole)
R	=	gas constant (8.2 x 10^{-5} atm-m^3/g-mole-°K)
T	=	atmospheric temperature (303.15 °K)

The Thibodeaux and Hwang equation assumes that the contaminant concentration in the liquid and gas phases in the soil remains constant until all of the contaminant has been volatilized into the surface ambient air. The emission rate, $E_{i(gw)}$, is non-zero until the time, t, is equal to a value, t_d, when the soil becomes dry and all contaminant has been volatilized. After time t_d, the volatilization emission rate is assumed to be zero. The estimation of t_d, in seconds, is obtained from the equation:

$$t_d = ((h^2 - d^2)/2D)(C_b/C_s) \tag{I.6}$$

where:

h	=	depth from the surface to the bottom of the UHSU layer (cm)

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d	=	depth of dry zone at sampling time (cm)
D	=	phase transfer coefficient (cm^2/sec)
C_b	=	bulk contaminant i concentration in soil (µg/L)
C_s	=	the liquid-phase concentration of contaminant i in the soil (µg/L)

The resultant soil gas concentration assumes an exchange rate from the volume under the building to the building volume above the floor to be only 0.1 percent. Therefore, only 0.1 percent of the volumetric exchange rate within the building is used. The resultant soil gas concentration is estimated by:

$$C_{sg} = Ei_{(t)}UC \;/\; (Q_b) \tag{I.7}$$

where:

C_{sg}	=	Resultant soil gas concentration (µg/m^3)
$Ei_{(t)}$	=	total VOC emission rate (the UHSU emission rate) (g/sec)
Q_b	=	0.1 percent of the volumetric exchange rate within the building (2.92E-05 m^3/sec)
UC	=	unit conversion (10^6 µg/g)

To estimate the diffusion of surface volatilization emissions through the floor of an onsite building, Darcy's law, modified for gas flow across a permeable structure wall, was used to estimate the volumetric flow rate induced by surface volatile emissions and ambient air entering into the building confines. This volumetric flow rate is estimated by:

$$Q_{vol} = g_c\, k\; A/v\; (dP/dZ) \tag{I.8}$$

where:

Q_{vol}	=	volumetric flow rate of induced by soil gas and ambient air
g_c	=	dimensionless constant (32.17 lb-ft/lb-sec^2)
k	=	intrinsic permeability of soil (7.49E-16 ft^2)
v	=	viscosity of the air (1.14E-05 lb/ft-sec)
dP	=	pressure differential across floor of structure (2.71E-04 lb/ft^2)

dZ	=	thickness of floor (1.5 ft)
A	=	area of the building floor (2,000 ft^2)

The concentration of the contaminant within the onsite building is then estimated by:

$$C_{con} = C_{sg} \left(Q_{vol} / Q_b \right) \tag{I.9}$$

where:

C_{con}	=	Resultant contaminant concentration within the building ($\mu g/m^3$)
Q_{vol}	=	volumetric flow rate induced by the soil gas (m^3/sec)
Q_b	=	volumetric exchange rate within the building (2.92E-02 m^3/sec)
C_{sg}	=	Resultant soil gas concentration ($\mu g/m^3$)

I2 MODELING SETUP

This modeling study was designed so that pollutant impacts could be determined at two receptor sets. The first set included on-site receptors located in the immediate vicinity within the OU6 areas of concern that are routinely exposed to outdoor air. The second set includes receptors located within a hypothetical building located within the areas of concern. The VVDM is best suited for estimating outdoor impacts at or near area source locations, and the soil gas transport model is best suited for estimating indoor impacts.

All particulate COCs (Table 5.1-1) were evaluated for impacts to onsite receptors that are assumed to be routinely exposed to outdoor air. The particulate COCs include: antimony, silver, vanadium, zinc (surface soil COCs); benzo(a)pyrene, benzo(b)fluroanthene, barium, U-233,234, and U-238 (subsurface soil COCs); and Am-241, and Pu-239/240 (surface and subsurface soil COCs). All groundwater VOC COCs (chloroform methylene chloride, PCE, TCE, and vinyl chloride) were evaluated for impacts to indoor receptors.

To minimize the number of model executions required for the VVDM, a Chi/Q approach was used for estimating all pollutant impacts from a single set of model runs. This approach assumes that a unit emission rate (1 g/sec) of a compound is released into the atmosphere. The ambient air concentration calculated by the models as a result of the unit emission rate is then scaled by the ratio of the actual COC emission rate to the unit emission rate to obtain ambient air concentrations for each COC. The scaling process was implemented through the use of a commercial spreadsheet software package.

For the particulate COCs, two emission scenarios were assessed: baseline (i.e., undisturbed soil) conditions and construction (i.e., disturbed soil) conditions. PM_{10} is the respirable fraction of total suspended particulates and is evaluated in the Baseline Human Health Risk Assessment. Therefore, emission rates for particulate COCs under each scenario were estimated by adjusting particulate emissions determined from AP-42 (EPA 1993b) emission factors for particulate matter with aerodynamic diameter less the 10 microns (PM_{10}) by considering actual in-soil concentrations of each COC. These emission rates were then used in the Chi/Q methodology described above.

Specifically, PM_{10} impacts were estimated for the following scenarios:

- Fugitive PM_{10} impacts at onsite receptors as a result of wind erosion from surface soils (modeled with the VVDM)

- Fugitive PM_{10} impacts at onsite receptors as a result of construction activities of the subsurface soils (modeled with the VVDM)

I3 MODEL INPUT PARAMETERS

Meteorological Parameters

For the VVDM, the maximum hourly Rocky Flats wind speed for each year (1989 to 1993) was input to the model. Then the model was executed only for the total number of hours that exceeded a threshold wind speed of 18.62 meters per second (m/s). The threshold wind speed is based on the OU3 Wind Tunnel Study conducted by MRI (1994). An exceedance of this value indicates the potential for the resuspension of particulates in air.

Source Parameters

The source input parameters used in VVDM include the dimensions defining the size of the box being modeled (i.e., the x,y dimensions of the area source of concern and the height) and the pollutant emission rate. These parameters are shown in Table I-1.

Emission Rate Parameters

A threshold wind speed of 18.62 m/s was incorporated into the wind erosion emission tables. This value was derived from the OU3 Wind Tunnel Study conducted by the Midwest Research Institute (MRI 1994). The equation used to predict emissions at the site is based on the measured erosion potential from the MRI study:

$$E = 0.309\ (E_{\mu} - E_{th})^{1.5} \tag{I.10}$$

where:

E = emission rate (g/m^2-hr)
E_{μ} = maximum wind speed (m/s)
E_{th} = threshold wind speed (18.62 m/s)

Emissions from soil exposed during construction activities were difficult to estimate because the actual construction activities that may occur were unknown. For the purposes of this study, it was assumed that construction activities would occur in a 10-acre parcel of land within each area of concern for one month. The heavy construction emission factor of 1.2 tons/acre-month of activity from AP-42, Section 11.2.4 (EPA 1993b) was used. This value is based on field measurements of total suspended particulates (TSP) from apartment and shopping center construction projects. Therefore, the emission factor was adjusted to estimate emissions specifically for PM_{10} by using a multiplier of 0.36 (Section 11.2.1 of EPA 1993c). The heavy construction emission factor does not use any site-specific data such as silt or moisture content and therefore may over or under estimate actual emissions. It is assumed that the site would be controlled for fugitive dust emissions by watering the construction site. As stated in AP-42, Section 11.2.4 (EPA 1993b) , it is reasonable to assume that emissions would be reduced by 50 percent. Therefore, the emission factor is divided by 2 to account for dust control.

Wind erosion emissions from disturbed construction areas are estimated from the AP-42, Section 8.19.1, emission factor of 1.7 lb/acre-day (EPA 1993b). This factor is representative of wind erosion on an inactive day.

Model Execution Parameters

The VVDM was executed so that 1-hour concentration averages were estimated for each hour of each year when the wind speed exceeded the 18.62 m/s threshold value described as part of the meteorological input parameters.

I4 RESULTS

Onsite Receptor Impacts Due to Wind Erosion of Surface Soils

Annual VVDM results for each area are shown in Tables I-2 through I-16. AOC No. 1 was evaluated once for the entire area. In addition to the entire area of concern, AOC No. 2 was evaluated for a 30 acre area.

Concentrations calculated for 1990 were the highest annual estimates for each area. This is because the maximum hourly wind speed (51.3 m/s) was the highest for the five year period. Air concentrations at AOC No. 1 ranged from 4.74E-13 $\mu g/m^3$ (americium-241) to 5.22E-04 $\mu g/m^3$ (zinc) (Table I-3). For AOC No. 2, the highest concentrations were estimated at the 30-acre site in 1990 (Table I-7). Air concentrations ranged from 4.43E-12 $\mu g/m^3$ (Am-241) to 1.02E-03 $\mu g/m^3$ (zinc).

Onsite Receptor Impacts Due to Construction Activities and Wind Erosion

Annual concentrations of contaminants as a result of heavy construction were summed with annual contaminant concentrations from the worst-case surface soil wind erosion year (1990) and wind erosion concentrations from the 10-acre disturbed construction area.

The summary for AOC No. 1 is shown in Table I-17. Individual wind erosion calculation used to predict wind erosion from construction activities at AOC No. 1 are shown in Tables I-18 to I-20. Concentrations for construction activities (sum of surface soil, 10 acre, and construction activity air concentrations) ranged from 4.74E-13 $\mu g/m^3$ (americium-241) to 5.22E-04 $\mu g/m^3$ (zinc).

The summary for AOC No. 2 is shown in Table I-21. Concentrations for construction activities (sum of surface soil, 10 acre, and construction activity air concentrations) ranged from 4.47E-14 $\mu g/m^3$ (americium-241) to 9.95E-06 $\mu g/m^3$ (zinc). Individual wind erosion calculations used to predict wind erosion from construction activities at AOC No. 2 are shown in Tables I-22 to I-24.

In-Building Impacts Due to Chemical Volatilization

Results of the soil gas transport model are shown in Table I-25. Soil gas transport modeling was not performed for AOC No. 1 since VOCs were not detected in subsurface soil or groundwater. The resultant building concentrations for the AOC No. 2 30-acre site range from 6.22E-09 $\mu g/m^3$ (chloroform) to 1.07E-07 $\mu g/m^3$ (trichloroethene).

I5 REFERENCES

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TABLE I-1

VVDM INPUT PARAMETERS

Box	Length (m)	Height (m)	Width (m)	Emissions (g/s)	Chi/Q ($\mu g/m^3$)
AOC 1	198.0	6.5	198.0	1.0	4.17+01
AOC 2					
10 Acre	206.0	6.7	206.0	1.0	3.89E-01
30 Acre	472.0	13.5	259.0	1.0	1.54E+01
50 Acre	594.0	16.4	343.0	1.0	9.55E-02

g/s Grams per second.
m Meters.
$\mu g/m^3$ Micrograms per cubic meter.

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TABLE I-2
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 1
1989

Contaminant	Soil Concentration (ug/kg)	AOC1 (ac)	AOC1 (m^2)	1989 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.65E+04	10.0	4.05E+04	2.13E+01	0.1371	2.54E-05	4.17E+01	1.06E-03	1.57E-06
Vanadium	3.34E+04	10.0	4.05E+04	2.13E+01	0.1371	5.15E-05	4.17E+01	2.15E-03	3.18E-06
Zinc	4.84E+04	10.0	4.05E+04	2.13E+01	0.1371	7.46E-05	4.17E+01	3.11E-03	4.61E-06
Radionuclides									
Americium-241	4.39E-05	10.0	4.05E+04	2.13E+01	0.1371	6.77E-14	4.17E+01	2.82E-12	4.19E-15
Plutonium-239/240	3.89E-03	10.0	4.05E+04	2.13E+01	0.1371	5.99E-12	4.17E+01	2.50E-10	3.71E-13

ac Acres.
g/m^2-hr Grams per square meter-hour.
g/s Grams per second.
m^2 Square meters.
ug/kg Micrograms per kilogram.
ug/m^3-g/s Micrograms per cubic meter-grams per second.
ug/m^3 Micrograms per cubic meter.

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TABLE I-3
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 1
1990

Contaminant	Soil Concentration (ug/kg)	AOC1 (ac)	AOC1 (m^2)	1990 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.65E+04	10.0	4.05E+04	5.13E+01	5.7807	1.07E-03	4.17E+01	4.47E-02	1.78E-04
Vanadium	3.34E+04	10.0	4.05E+04	5.13E+01	5.7807	2.17E-03	4.17E+01	9.05E-02	3.61E-04
Zinc	4.84E+04	10.0	4.05E+04	5.13E+01	5.7807	3.14E-03	4.17E+01	1.31E-01	5.22E-04
Radionuclides									
Americium-241	4.39E-05	10.0	4.05E+04	5.13E+01	5.7807	2.85E-12	4.17E+01	1.19E-10	4.74E-13
Plutonium-239/240	3.89E-03	10.0	4.05E+04	5.13E+01	5.7807	2.53E-10	4.17E+01	1.05E-08	4.20E-11

ac	Acres.
g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

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TABLE I-4
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 1
1991

Contaminant	Soil Concentration (ug/kg)	AOC1 (ac)	AOC1 (m^2)	1991 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.65E+04	10.0	4.05E+04	2.48E+01	0.4747	8.81E-05	4.17E+01	3.67E-03	8.38E-06
Vanadium	3.34E+04	10.0	4.05E+04	2.48E+01	0.4747	1.78E-04	4.17E+01	7.43E-03	1.70E-05
Zinc	4.84E+04	10.0	4.05E+04	2.48E+01	0.4747	2.58E-04	4.17E+01	1.08E-02	2.46E-05
Radionuclides									
Americium-241	4.39E-05	10.0	4.05E+04	2.48E+01	0.4747	2.34E-13	4.17E+01	9.77E-12	2.23E-14
Plutonium-239/240	3.89E-03	10.0	4.05E+04	2.48E+01	0.4747	2.08E-11	4.17E+01	8.66E-10	1.98E-12

ac	Acres.
g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

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TABLE I-5
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 1
1992

Contaminant	Soil Concentration (ug/kg)	AOC1 (ac)	AOC1 (m^2)	1992 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.65E+04	10.0	4.05E+04	2.34E+01	0.3229	5.99E-05	4.17E+01	2.50E-03	3.71E-06
Vanadium	3.34E+04	10.0	4.05E+04	2.34E+01	0.3229	1.21E-04	4.17E+01	5.05E-03	7.50E-06
Zinc	4.84E+04	10.0	4.05E+04	2.34E+01	0.3229	1.76E-04	4.17E+01	7.32E-03	1.09E-05
Radionuclides									
Americium-241	4.39E-05	10.0	4.05E+04	2.34E+01	0.3229	1.59E-13	4.17E+01	6.65E-12	9.86E-15
Plutonium-239/240	3.89E-03	10.0	4.05E+04	2.34E+01	0.3229	1.41E-11	4.17E+01	5.89E-10	8.74E-13

ac	Acres.
g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

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TABLE I-6
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 1
1993

Contaminant	Soil Concentration (ug/kg)	AOC1 (ac)	AOC1 (m^2)	1993 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.65E+04	10.0	4.05E+04	2.41E+01	0.3921	7.27E-05	4.17E+01	3.03E-03	1.00E-05
Vanadium	3.34E+04	10.0	4.05E+04	2.41E+01	0.3921	1.47E-04	4.17E+01	6.14E-03	2.03E-05
Zinc	4.84E+04	10.0	4.05E+04	2.41E+01	0.3921	2.13E-04	4.17E+01	8.89E-03	2.94E-05
Radionuclides									
Americium-241	4.39E-05	10.0	4.05E+04	2.41E+01	0.3921	1.93E-13	4.17E+01	8.07E-12	2.67E-14
Plutonium-239/240	3.89E-03	10.0	4.05E+04	2.41E+01	0.3921	1.71E-11	4.17E+01	7.15E-10	2.37E-12

ac	Acres.
g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

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TABLE I-7
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 2 FOR A 30 ACRE SITE
1989

Contaminant	Soil Concentration (ug/kg)	AOC2 (ac)	AOC2 (m^2)	1989 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.41E+04	30.0	1.21E+05	2.13E+01	0.1371	6.51E-05	1.54E+01	1.00E-03	1.49E-06
Silver	2.64E+03	30.0	1.21E+05	2.13E+01	0.1371	1.22E-05	1.54E+01	1.88E-04	2.79E-07
Vanadium	3.43E+04	30.0	1.21E+05	2.13E+01	0.1371	1.59E-04	1.54E+01	2.44E-03	3.63E-06
Zinc	8.57E+04	30.0	1.21E+05	2.13E+01	0.1371	3.96E-04	1.54E+01	6.10E-03	9.05E-06
Radionuclides									
Americium-241	3.70E-04	30.0	1.21E+05	2.13E+01	0.1371	1.71E-12	1.54E+01	2.63E-11	3.91E-14
Plutonium-239/240	4.25E-02	30.0	1.21E+05	2.13E+01	0.1371	1.96E-10	1.54E+01	3.03E-09	4.49E-12

ac	Acres.
g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

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TABLE I-8
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 2 FOR A 30 ACRE SITE
1990

Contaminant	Soil Concentration (ug/kg)	AOC2 (ac)	AOC2 (m^2)	1990 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.41E+04	30.0	1.21E+05	5.13E+01	5.7807	2.75E-03	1.54E+01	4.23E-02	1.69E-04
Silver	2.64E+03	30.0	1.21E+05	5.13E+01	5.7807	5.15E-04	1.54E+01	7.93E-03	3.16E-05
Vanadium	3.43E+04	30.0	1.21E+05	5.13E+01	5.7807	6.69E-03	1.54E+01	1.03E-01	4.10E-04
Zinc	8.57E+04	30.0	1.21E+05	5.13E+01	5.7807	1.67E-02	1.54E+01	2.57E-01	1.02E-03
Radionuclides									
Americium-241	3.70E-04	30.0	1.21E+05	5.13E+01	5.7807	7.21E-11	1.54E+01	1.11E-09	4.43E-12
Plutonium-239/240	4.25E-02	30.0	1.21E+05	5.13E+01	5.7807	8.29E-09	1.54E+01	1.28E-07	5.08E-10

ac	Acres.
g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

TABLE I-9
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 2 FOR A 30 ACRE SITE
1991

Contaminant	Soil Concentration (ug/kg)	AOC2 (ac)	AOC2 (m^2)	1991 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.41E+04	30.0	1.21E+05	2.48E+01	0.4747	2.26E-04	1.54E+01	3.47E-03	7.93E-06
Silver	2.64E+03	30.0	1.21E+05	2.48E+01	0.4747	4.23E-05	1.54E+01	6.51E-04	1.49E-06
Vanadium	3.43E+04	30.0	1.21E+05	2.48E+01	0.4747	5.49E-04	1.54E+01	8.46E-03	1.93E-05
Zinc	8.57E+04	30.0	1.21E+05	2.48E+01	0.4747	1.37E-03	1.54E+01	2.11E-02	4.82E-05
Radionuclides									
Americium-241	3.70E-04	30.0	1.21E+05	2.48E+01	0.4747	5.92E-12	1.54E+01	9.12E-11	2.08E-13
Plutonium-239/240	4.25E-02	30.0	1.21E+05	2.48E+01	0.4747	6.80E-10	1.54E+01	1.05E-08	2.39E-11

ac	Acres.
g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

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TABLE I-10
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 2 FOR A 30 ACRE SITE
1992

Contaminant	Soil Concentration (ug/kg)	AOC2 (ac)	AOC2 (m^2)	1992 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.41E+04	30.0	1.21E+05	2.34E+01	0.3229	1.53E-04	1.54E+01	2.36E-03	3.51E-06
Silver	2.64E+03	30.0	1.21E+05	2.34E+01	0.3229	2.88E-05	1.54E+01	4.43E-04	6.57E-07
Vanadium	3.43E+04	30.0	1.21E+05	2.34E+01	0.3229	3.74E-04	1.54E+01	5.75E-03	8.54E-06
Zinc	8.57E+04	30.0	1.21E+05	2.34E+01	0.3229	9.33E-04	1.54E+01	1.44E-02	2.13E-05
Radionuclides									
Americium-241	3.70E-04	30.0	1.21E+05	2.34E+01	0.3229	4.03E-12	1.54E+01	6.21E-11	9.21E-14
Plutonium-239/240	4.25E-02	30.0	1.21E+05	2.34E+01	0.3229	4.63E-10	1.54E+01	7.13E-09	1.06E-11

ac Acres.
g/m^2-hr Grams per square meter-hour.
g/s Grams per second.
m^2 Square meters.
ug/kg Micrograms per kilogram.
ug/m^3-g/s Micrograms per cubic meter-grams per second.
ug/m^3 Micrograms per cubic meter.

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TABLE I-11
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 2 FOR A 30 ACRE SITE
1993

Contaminant	Soil Concentration (ug/kg)	AOC2 (ac)	AOC2 (m^2)	1993 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.41E+04	30.0	1.21E+05	2.41E+01	0.3921	1.86E-04	1.54E+01	2.87E-03	9.50E-06
Silver	2.64E+03	30.0	1.21E+05	2.41E+01	0.3921	3.49E-05	1.54E+01	5.38E-04	1.78E-06
Vanadium	3.43E+04	30.0	1.21E+05	2.41E+01	0.3921	4.54E-04	1.54E+01	6.99E-03	2.31E-05
Zinc	8.57E+04	30.0	1.21E+05	2.41E+01	0.3921	1.13E-03	1.54E+01	1.74E-02	5.77E-05
Radionuclides									
Americium-241	3.70E-04	30.0	1.21E+05	2.41E+01	0.3921	4.89E-12	1.54E+01	7.53E-11	2.49E-13
Plutonium-239/240	4.25E-02	30.0	1.21E+05	2.41E+01	0.3921	5.62E-10	1.54E+01	8.65E-09	2.86E-11

ac	Acres.
g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

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TABLE I-12
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 2
1989

Contaminant	Soil Concentration (ug/kg)	AOC2 (ac)	AOC2 (m^2)	1989 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.65E+04	50.0	2.02E+05	2.13E+01	0.1371	1.27E-04	9.55E-02	1.21E-05	1.80E-08
Silver	2.31E+03	50.0	2.02E+05	2.13E+01	0.1371	1.78E-05	9.55E-02	1.70E-06	2.52E-09
Vanadium	3.61E+04	50.0	2.02E+05	2.13E+01	0.1371	2.78E-04	9.55E-02	2.66E-05	3.95E-08
Zinc	8.05E+04	50.0	2.02E+05	2.13E+01	0.1371	6.20E-04	9.55E-02	5.92E-05	8.79E-08
Radionuclides									
Americium-241	3.61E-04	50.0	2.02E+05	2.13E+01	0.1371	2.78E-12	9.55E-02	2.66E-13	3.94E-16
Plutonium-239/240	3.81E-02	50.0	2.02E+05	2.13E+01	0.1371	2.94E-10	9.55E-02	2.80E-11	4.16E-14

ac	Acres.
g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

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TABLE I-13
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 2
1990

Contaminant	Soil Concentration (ug/kg)	AOC2 (ac)	AOC2 (m^2)	1990 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.65E+04	50.0	2.02E+05	5.13E+01	5.7807	5.36E-03	9.55E-02	5.12E-04	2.04E-06
Silver	2.31E+03	50.0	2.02E+05	5.13E+01	5.7807	7.51E-04	9.55E-02	7.17E-05	2.86E-07
Vanadium	3.61E+04	50.0	2.02E+05	5.13E+01	5.7807	1.17E-02	9.55E-02	1.12E-03	4.47E-06
Zinc	8.05E+04	50.0	2.02E+05	5.13E+01	5.7807	2.61E-02	9.55E-02	2.50E-03	9.95E-06
Radionuclides									
Americium-241	3.61E-04	50.0	2.02E+05	5.13E+01	5.7807	1.17E-10	9.55E-02	1.12E-11	4.46E-14
Plutonium-239/240	3.81E-02	50.0	2.02E+05	5.13E+01	5.7807	1.24E-08	9.55E-02	1.18E-09	4.71E-12

ac	Acres.
g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

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TABLE I-14
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 2
1991

Contaminant	Soil Concentration (ug/kg)	AOC2 (ac)	AOC2 (m^2)	1991 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.65E+04	50.0	2.02E+05	2.48E+01	0.4747	4.40E-04	9.55E-02	4.20E-05	9.59E-08
Silver	2.31E+03	50.0	2.02E+05	2.48E+01	0.4747	6.16E-05	9.55E-02	5.89E-06	1.34E-08
Vanadium	3.61E+04	50.0	2.02E+05	2.48E+01	0.4747	9.64E-04	9.55E-02	9.21E-05	2.10E-07
Zinc	8.05E+04	50.0	2.02E+05	2.48E+01	0.4747	2.15E-03	9.55E-02	2.05E-04	4.68E-07
Radionuclides									
Americium-241	3.61E-04	50.0	2.02E+05	2.48E+01	0.4747	9.63E-12	9.55E-02	9.20E-13	2.10E-15
Plutonium-239/240	3.81E-02	50.0	2.02E+05	2.48E+01	0.4747	1.02E-09	9.55E-02	9.71E-11	2.22E-13

ac Acres.
g/m^2-hr Grams per square meter-hour.
g/s Grams per second.
m^2 Square meters.
ug/kg Micrograms per kilogram.
ug/m^3-g/s Micrograms per cubic meter-grams per second.
ug/m^3 Micrograms per cubic meter.

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TABLE I-15
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 2
1992

Contaminant	Soil Concentration (ug/kg)	AOC2 (ac)	AOC2 (m^2)	1992 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.65E+04	50.0	2.02E+05	2.34E+01	0.3229	2.99E-04	9.55E-02	2.86E-05	4.24E-08
Silver	2.31E+03	50.0	2.02E+05	2.34E+01	0.3229	4.19E-05	9.55E-02	4.00E-06	5.94E-09
Vanadium	3.61E+04	50.0	2.02E+05	2.34E+01	0.3229	6.56E-04	9.55E-02	6.26E-05	9.29E-08
Zinc	8.05E+04	50.0	2.02E+05	2.34E+01	0.3229	1.46E-03	9.55E-02	1.39E-04	2.07E-07
Radionuclides									
Americium-241	3.61E-04	50.0	2.02E+05	2.34E+01	0.3229	6.55E-12	9.55E-02	6.26E-13	9.29E-16
Plutonium-239/240	3.81E-02	50.0	2.02E+05	2.34E+01	0.3229	6.92E-10	9.55E-02	6.60E-11	9.80E-14

ac	Acres.
g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

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TABLE I-16
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 2
1993

Contaminant	Soil Concentration (ug/kg)	AOC2 (ac)	AOC2 (m^2)	1993 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.65E+04	50.0	2.02E+05	2.41E+01	0.3921	3.63E-04	9.55E-02	3.47E-05	1.15E-07
Silver	2.31E+03	50.0	2.02E+05	2.41E+01	0.3921	5.09E-05	9.55E-02	4.86E-06	1.61E-08
Vanadium	3.61E+04	50.0	2.02E+05	2.41E+01	0.3921	7.96E-04	9.55E-02	7.60E-05	2.52E-07
Zinc	8.05E+04	50.0	2.02E+05	2.41E+01	0.3921	1.77E-03	9.55E-02	1.69E-04	5.61E-07
Radionuclides									
Americium-241	3.61E-04	50.0	2.02E+05	2.41E+01	0.3921	7.96E-12	9.55E-02	7.60E-13	2.52E-15
Plutonium-239/240	3.81E-02	50.0	2.02E+05	2.41E+01	0.3921	8.40E-10	9.55E-02	8.02E-11	2.65E-13

ac	Acres.
g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

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TABLE I-17
SUMMARY OF THE ANNUAL AVERAGE AIR CONCENTRATIONS DURING HEAVY CONSTRUCTION ACTIVITIES ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE WIND EROSION AT AOC NO. 1

	Surface Soil Wind Erosion Annual Contaminant Air Concentration (ug/m^3)	10 Acre Disturbed Construction Area Annual Contaminant Air Concentration (ug/m^3)	Heavy Construction Activities Annual Contaminant Air Concentration (ug/m^3)
Metals			
Antimony	1.78E-04	-	-
Barium	-	1.55E-07	1.31E-06
Vanadium	3.61E-04	-	-
Zinc	5.22E-04	-	-
Radionuclides			
Americium-241	4.74E-13	4.48E-18	3.78E-17
Plutonium-239/240	4.20E-11	3.40E-16	2.87E-15
Uranium-233,234	-	1.55E-13	1.31E-12
Uranium-238	-	5.53E-09	4.67E-08

Surface soil (Table I-18) + 10 acre disturbed construction area (Table I-19) + construction activities (Table I-20)

	Concentration (ug/m^3)
Metals	
Antimony	1.78E-04
Barium	1.46E-06
Vanadium	3.61E-04
Zinc	5.22E-04
Radionuclides	
Americium-241	4.74E-13
Plutonium-239/240	4.20E-11
Uranium-233,234	1.47E-12
Uranium-238	5.22E-08

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TABLE I-18
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 1

Contaminant	Soil Concentration (ug/kg)	AOC1 (ac)	AOC1 (m^2)	1990 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.65E+04	10.0	4.05E+04	5.13E+01	5.7807	1.07E-03	4.17E+01	4.47E-02	1.78E-04
Vanadium	3.34E+04	10.0	4.05E+04	5.13E+01	5.7807	2.17E-03	4.17E+01	9.05E-02	3.61E-04
Zinc	4.84E+04	10.0	4.05E+04	5.13E+01	5.7807	3.14E-03	4.17E+01	1.31E-01	5.22E-04
Radionuclides									
Americium-241	4.39E-05	10.0	4.05E+04	5.13E+01	5.7807	2.85E-12	4.17E+01	1.19E-10	4.74E-13
Plutonium-239/240	3.89E-03	10.0	4.05E+04	5.13E+01	5.7807	2.53E-10	4.17E+01	1.05E-08	4.20E-11

ac	Acres.
g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^2/day	Micrograms per square meter per day.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

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TABLE I-19
ANNUAL AVERAGE AIR CONCENTRATIONS
10 ACRE DISTURBED CONSTRUCTION AREA
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AOC NO. 1

Contaminant		Subsurface Soil Concentration	AOC1 (m^2)	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals		**(mg/kg)**						
Barium		1.29E+02	4.05E+04	7.94E-03	1.15E-05	3.37E+00	3.88E-05	1.55E-07
Radionuclides	**(pCi/g)**	**(ug/kg)**						
Americium-241	1.29E-02	3.74E-06	4.05E+04	7.94E-03	3.34E-16	3.37E+00	1.12E-15	4.48E-18
Plutonium-239/240	2.07E-02	2.84E-04	4.05E+04	7.94E-03	2.53E-14	3.37E+00	8.53E-14	3.40E-16
Uranium-233,234	8.00E-01	1.30E-01	4.05E+04	7.94E-03	1.16E-11	3.37E+00	3.90E-11	1.55E-13
Uranium-238	1.54E+00	4.62E+03	4.05E+04	7.94E-03	4.12E-07	3.37E+00	1.39E-06	5.53E-09

g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^2/day	Micrograms per square meter per day.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

TABLE I-20
ANNUAL AVERAGE AIR CONCENTRATIONS
CONSTRUCTION WORKER PERFORMING HEAVY CONSTRUCTION
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AOC NO. 1

Contaminant		Subsurface Soil Concentration	AOC1 (m^2)	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals		**(mg/kg)**						
Barium		1.29E+02	4.05E+04	6.70E-02	9.73E-05	3.37E+00	3.28E-04	1.31E-06
Radionuclides	**(pCi/g)**	**(ug/kg)**						
Americium-241	1.29E-02	3.74E-06	4.05E+04	6.70E-02	2.82E-15	3.37E+00	9.49E-15	3.78E-17
Plutonium-239/240	2.07E-02	2.84E-04	4.05E+04	6.70E-02	2.14E-13	3.37E+00	7.19E-13	2.87E-15
Uranium-233,234	8.00E-01	1.30E-01	4.05E+04	6.70E-02	9.76E-11	3.37E+00	3.29E-10	1.31E-12
Uranium-238	1.54E+00	4.62E+03	4.05E+04	6.70E-02	3.48E-06	3.37E+00	1.17E-05	4.67E-08

g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
ug/kg	Micrograms per kilogram.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.
ug/m^3	Micrograms per cubic meter.

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TABLE I-21
SUMMARY OF THE ANNUAL AVERAGE AIR CONCENTRATIONS DURING HEAVY CONSTRUCTION ACTIVITIES ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE WIND EROSION AT OU6 AOC NO. 2

	Surface Soil Wind Erosion Annual Contaminant Air Concentration (ug/m³)	10 Acre Disturbed Construction Area Annual Contaminant Air Concentration (ug/m³)	Heavy Construction Activities Annual Contaminant Air Concentration (ug/m³)
Semi-VOCs			
Benzo(a)pyrene	-	1.56E-10	1.31E-09
Benzo(b)fluoranthene	-	2.04E-10	1.72E-09
Metals			
Antimony	2.04E-06	-	-
Barium	-	1.91E-07	1.61E-06
Silver	2.86E-07	-	-
Vanadium	4.47E-06	-	-
Zinc	9.95E-06	-	-
Radionuclides			
Americium-241	4.46E-14	8.68E-18	7.33E-17
Plutonium-239/240	4.71E-12	2.26E-15	1.91E-14
Uranium-233,234	-	1.52E-13	1.29E-12
Uranium-238	-	2.85E-09	2.40E-08

Surface soil (Table I-22) + 10 acre disturbed construction area (Table I-23) + construction activities (Table I-24)

	Concentration (ug/m³)
Semi-VOCs	
Benzo(a)pyrene	1.47E-09
Benzo(b)fluoranthene	1.92E-09
Metals	
Antimony	2.04E-06
Barium	1.81E-06
Silver	2.86E-07
Vanadium	4.47E-06
Zinc	9.95E-06
Radionuclides	

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TABLE I-22
ANNUAL AVERAGE AIR CONCENTRATIONS
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AREA OF CONCERN NO. 2

Contaminant	Soil Concentration (ug/kg)	AOC2 (ac)	AOC2 (m^2)	1990 MAX. U	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Metals									
Antimony	1.65E+04	50.0	2.02E+05	5.13E+01	5.7807	5.36E-03	9.55E-02	5.12E-04	2.04E-06
Silver	2.31E+03	50.0	2.02E+05	5.13E+01	5.7807	7.51E-04	9.55E-02	7.17E-05	2.86E-07
Vanadium	3.61E+04	50.0	2.02E+05	5.13E+01	5.7807	1.17E-02	9.55E-02	1.12E-03	4.47E-06
Zinc	8.05E+04	50.0	2.02E+05	5.13E+01	5.7807	2.61E-02	9.55E-02	2.50E-03	9.95E-06
Radionuclides									
Americium-241	3.61E-04	50.0	2.02E+05	5.13E+01	5.7807	1.17E-10	9.55E-02	1.12E-11	4.46E-14
Plutonium-239/240	3.81E-02	50.0	2.02E+05	5.13E+01	5.7807	1.24E-08	9.55E-02	1.18E-09	4.71E-12

ac	Acres.
g/m^2-hr	Grams per square meter-hour.
g/s	Grams per second.
m^2	Square meters.
mg/kg	Milligrams per kilogram.
ug/kg	Micrograms per kilogram.
ug/m^3-g/s	Micrograms per cubic meter-grams per second.

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TABLE I-23
ANNUAL AVERAGE AIR CONCENTRATIONS
10 ACRE DISTURBED CONSTRUCTION AREA
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AOC NO. 2

Contaminant		Subsurface Soil Concentration	AOC2 (m^2)	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Semi-VOCs		(ug/kg)						
Benzo(a)pyrene		1.30E+02	4.05E+04	7.94E-03	1.16E-08	3.37E+00	3.91E-08	1.56E-10
Benzo(b)fluoranthene		1.70E+02	4.05E+04	7.94E-03	1.52E-08	3.37E+00	5.11E-08	2.04E-10
Metals		(mg/kg)						
Barium		1.60E+02	4.05E+04	7.94E-03	1.43E-05	3.37E+00	4.80E-05	1.91E-07
Radionuclides	(pCi/g)	(ug/kg)						
Americium-241	2.50E-02	7.25E-06	4.05E+04	7.94E-03	6.47E-16	3.37E+00	2.18E-15	8.68E-18
Plutonium-239/240	1.38E-01	1.89E-03	4.05E+04	7.94E-03	1.69E-13	3.37E+00	5.68E-13	2.26E-15
Uranium-233,234	7.85E-01	1.27E-01	4.05E+04	7.94E-03	1.14E-11	3.37E+00	3.82E-11	1.52E-13
Uranium-238	7.93E-01	2.38E+03	4.05E+04	7.94E-03	2.12E-07	3.37E+00	7.15E-07	2.85E-09

g/m^2-hr Grams per square meter-hour.
g/s Grams per second.
m^2 Square meters.

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TABLE I-24
ANNUAL AVERAGE AIR CONCENTRATIONS
CONSTRUCTION WORKER PERFORMING HEAVY CONSTRUCTION
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
WIND EROSION AT OU6 AOC NO. 2

Contaminant		Subsurface Soil Concentration	AOC2 (m^2)	Particulate Emission Potential (g/m^2-hr)	Contaminant Emission Potential (g/s)	Chi/Q 1-hr Air Concentration (ug/m^3-g/s)	Contaminant 1 hr Air Concentration (ug/m^3)	Annual Contaminant Air Concentration (ug/m^3)
Semi-VOCs		**(ug/kg)**						
Benzo(a)pyrene		1.30E+02	4.05E+04	6.70E-02	9.79E-08	3.37E+00	3.30E-07	1.31E-09
Benzo(b)fluoranthene		1.70E+02	4.05E+04	6.70E-02	1.28E-07	3.37E+00	4.31E-07	1.72E-09
Metals		**(mg/kg)**						
Barium		1.60E+02	4.05E+04	6.70E-02	1.20E-04	3.37E+00	4.05E-04	1.61E-06
Radionuclides	**(pCi/g)**	**(ug/kg)**						
Americium-241	2.50E-02	7.25E-06	4.05E+04	6.70E-02	5.46E-15	3.37E+00	1.84E-14	7.33E-17
Plutonium-239/240	1.38E-01	1.89E-03	4.05E+04	6.70E-02	1.42E-12	3.37E+00	4.80E-12	1.91E-14
Uranium-233,234	7.85E-01	1.27E-01	4.05E+04	6.70E-02	9.58E-11	3.37E+00	3.23E-10	1.29E-12
Uranium-238	7.93E-01	2.38E+03	4.05E+04	6.70E-02	1.79E-06	3.37E+00	6.03E-06	2.40E-08

g/m^2-hr — Grams per square meter-hour.
g/s — Grams per second.
m^2 — Square meters.

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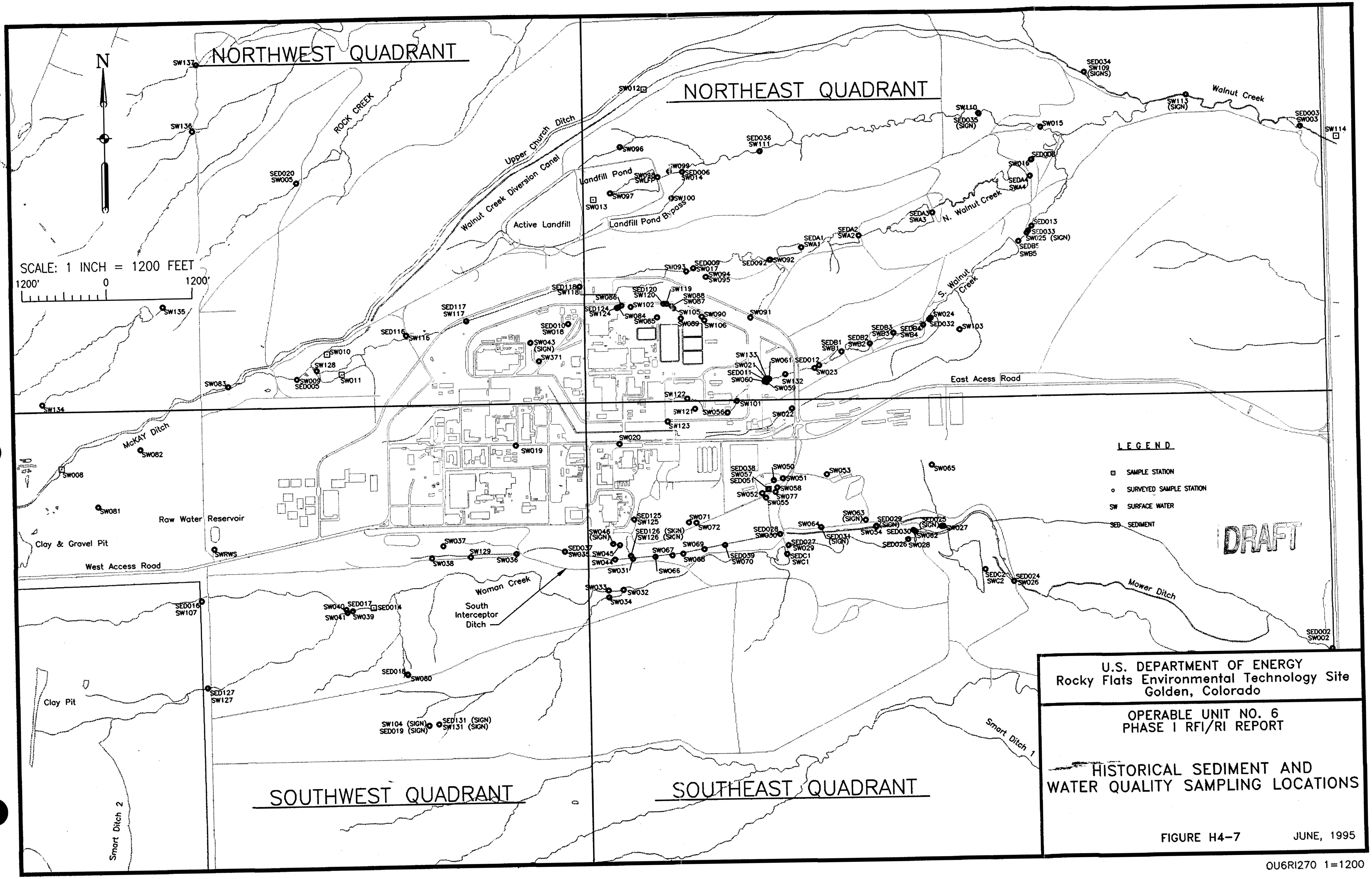
TABLE I-25
SOIL GAS TRANSPORT MODEL
AT THE ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
FOR A 30 ACRE SITE AT OU6 AOC NO. 2

30-YEAR AVERAGE UHSU VOLATILE COMPOUND EMISSION RATES AT AN AMBIENT TEMPERATURE OF 30 DEG. C.

Compound	Diffusion Coeff. (cm^2/sec)	Soil Porosity (cm^3/cm^3)	Henry's Law Cst. ($atm\text{-}m^3/g\text{-}mole$)	Phase Trans. Coeff. (cm^2/sec)	Groundwater Concentration (ug/L)	Site Surface Area (cm)	Soil Depth from the Surface to Under the UHSU Layer (cm)	Kd (cm^3/g)	Bulk Soil Concentration (ug/L)	Duration of Release (sec)
Chloroform	9.40E-02	1.00E-01	2.90E-03	5.09E-04	1.00E+00	1.22E+09	4.04E+02	4.40E-02	8.54E-02	4.30E+15
Methylene chloride	8.50E-02	1.00E-01	2.00E-03	3.17E-04	1.40E+01	1.22E+09	4.04E+02	9.00E-03	2.44E-01	1.41E+15
Tetrachloroethene	7.85E-02	1.00E-01	1.53E-02	2.24E-03	3.00E+00	1.22E+09	4.04E+02	3.60E-01	2.10E+00	7.98E+15
Trichloroethene	8.61E-02	1.00E-01	9.10E-03	1.46E-03	6.00E+00	1.22E+09	4.04E+02	1.50E-01	1.75E+00	5.10E+15

TOTAL VOLATILE COMPOUND EMISSION RATES AND RESULTANT SOIL GAS CONCENTRATIONS UNDER THE BUILDING ASSUMING EXCHANGE RATE OF ONLY 0.1% OF BUILDING VOLUME ABOVE

Compound	UHSU Emission Rate (g/sec)	Under Bldg. Flw Rt (m^3/sec)	Result. Soil Gas Conc. (ug/m^3)
Chloroform	2.46E-10	2.92E-05	8.42E+00
Methylene chloride	2.15E-09	2.92E-05	7.35E+01
Tetrachloroethene	3.25E-09	2.92E-05	1.11E+02



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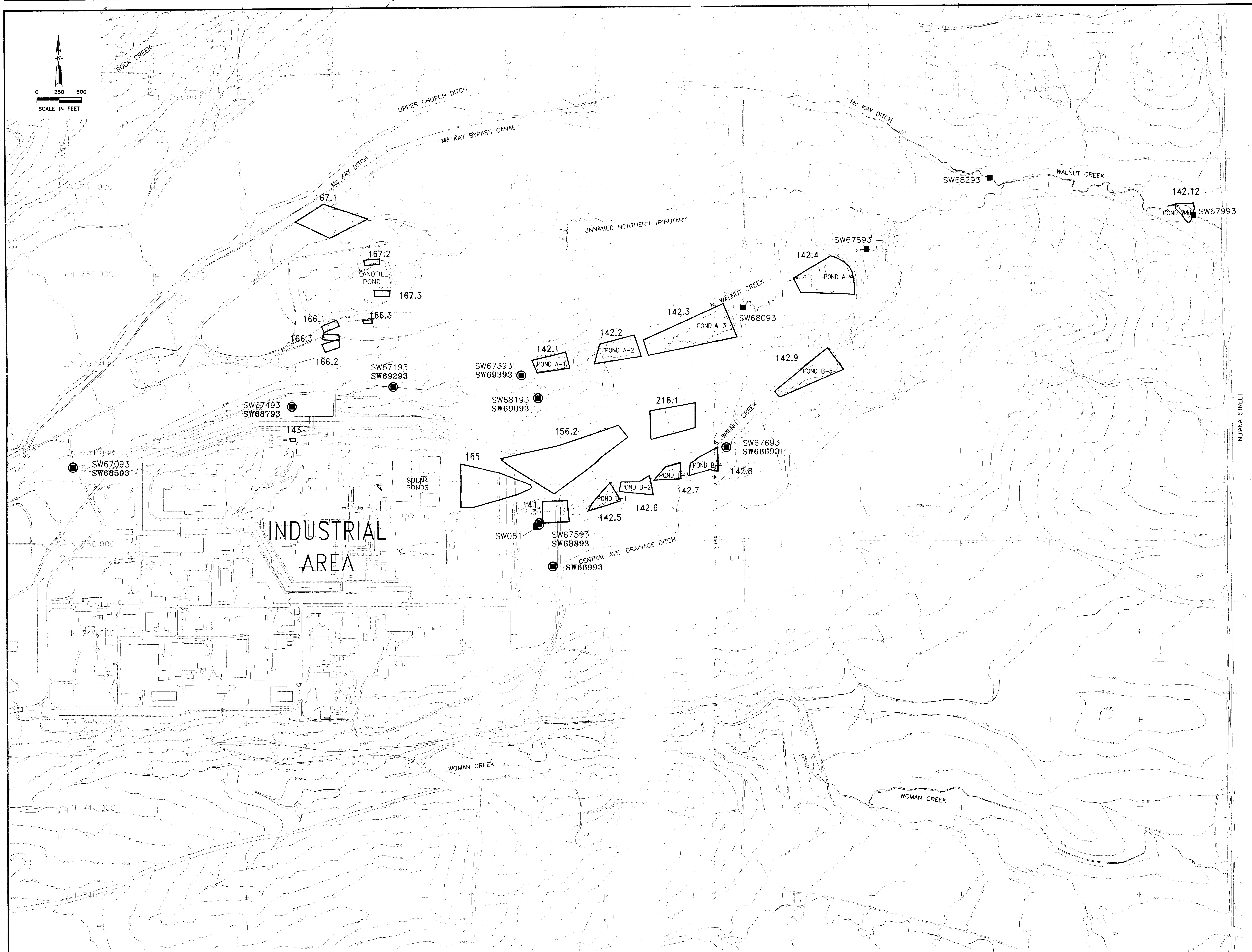
OPERABLE UNIT NO. 6
PHASE I RFI/RI REPORT

HISTORICAL SEDIMENT AND
WATER QUALITY SAMPLING LOCATIONS

FIGURE H4-7 JUNE, 1995

OU6RI270 1=1200



EXPLANATION

IHSS BOUNDARIES

216.1 IHSS NUMBER

SW67993 BASEFLOW

SW68593 STORM RUNOFF

PONDS/LAKES

22x3

U.S. DEPARTMENT OF ENERGY
Rocky Flats Environmental Technology Site
Golden, Colorado

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1993 SURFACE WATER
SAMPLING LOCATIONS

PLATE H1-1

JUNE 1995

6/5/95

OU6RI306 1=500